ON THE COVER

MENTION of Yukon Territory usually brings thoughts of the Klondike gold rush, one of the greatest of the world's many stampedes for the yellow metal. Although gold has lost caste, so to speak, among nations, it is still as much wanted as ever by individuals. Consequently, the hunt for it goes on unabated. Whereas most prospecting pictures show a panner working on the edge of a stream in quiet water, the man on our cover is right out in the swiftly moving current.

•

IN THIS ISSUE

AS WAS expected by its creators and expressed in its name, the Quarrymaster drill is being used principally in quarrying and open-pit mining. That it can be of service in other fields is shown by its performance on a road-building job in New England. There an ingenious contractor drilled blast holes with it on sections where the depth of cut and other conditions did not favor traditionally used wagon drills. Noteworthy savings resulted. Page 164.

•

AMONG the great names in the field of furniture designing that Scotland has bequeathed the world are Chippendale, Sheraton, Adams, and Hepplewhite. Endeavoring to carry on in their tradition is Neil Morris, 31-year-old head of a company that bears his name. He has created fine furniture for royalty, as well as for some of the largest ships afloat. His major effort, however, is directed towards mass production of pieces at prices the average family can afford to pay. In doing this he has turned to the use of compressed air on a large scale. Page 169.

•

LONG BEACH in California is one of the few cities that have sources of natural gas within their boundaries. However, there are many intermediate steps in getting the gas from wells to burners. The city has just completed improvements in its distribution set-up, which included the modernization of a compressor plant. Page 176.

•

BELATED attention is paid to Shasta Dam cableway, a gigantic aerial transportation system that moved an average of 4000 tons of concrete daily during the 4½-year construction period. Page 174.

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CORRECTION

THE bridge shown as illustration No. 1 on page 154 of our June issue and described as the Golden Gate Bridge is actually the San Francisco-Oakland Bay structure.

Compressed Air Magazine

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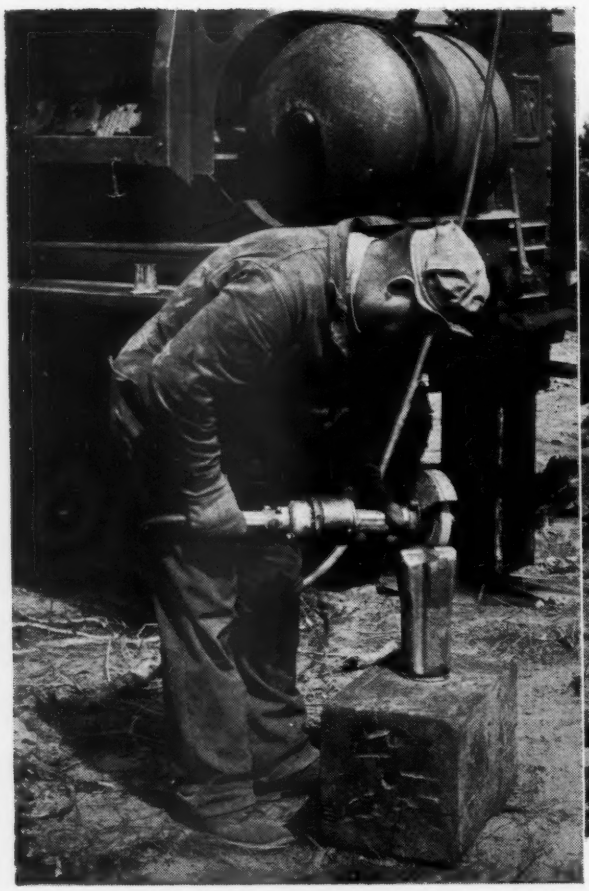
The New Hampshire Turnpike

Self-Contained Quarrymaster Drill Using 5½-inch Detachable Carset Bit Speeds Excavation Work in Heavy Cuts

Walter P. Gillingham



DRESSING LARGE BIT

The 5½-inch-gauge Carset bits used with the Quarrymaster drill are reconditioned as shown here, the Carboloy inserts being dressed with a hand-held air-operated grinder.

NEW ENGLAND'S dream of a 4-lane highway stretching from New York City to Portland, Maine, is one step nearer reality with the construction of the New Hampshire Turnpike. This superhighway, now being built across the narrow neck of land which forms the seacoast of New Hampshire, will connect on the north with the Maine Turnpike and on the south with the existing roadway system of the State of Massachusetts. It will afford through traffic a direct and time-saving route across New Hampshire.

Motorists leaving New York City for points in New England can now travel the first part of their journey on 4-lane highways from the very heart of the metropolis. The Merritt Parkway and its northern extension, Wilbur Cross Parkway, reach across the State of Connecticut nearly to the Massachusetts border. Farther north, the Maine Turnpike begins at Kittery and extends to Portland. The gap between the latter and the Wilbur Cross Parkway is being narrowed by the New Hampshire Turnpike, and sometime in the future similar roads will span the remaining distance so that automobiles can cover the 300-odd miles between New York City and Portland practically uninterrupted by cross traffic, stop lights, and reduced-speed zones.

The New Hampshire Turnpike begins at a point on the Massachusetts-New Hampshire line near Smithtown and ends in Portsmouth at the Maine-New Hampshire interstate bridge. When finished, it will be approximately 15

EFFECTIVE DRILLING COMBINATION

Wagon drills have long been conventional equipment on roadbuilding jobs and eight of them are utilized on this one. However, the contractor figured that it would be less expensive to drill the heaviest cuts with the new deep-hole Quarrymaster, and results are confirming his judgment. Two pictures of the rig are shown here. In the one at the left the workman in front of the machine has just put in place the hooded end of the flexible tubing that carries rock cuttings to the storage hoppers. A pile of cuttings can be seen in the foreground. The man on the side of the machine is checking the compressors, while the operator, hidden in the cab, directs the drilling. Just above is another side view of the Quarrymaster with two of its crew (right) loading holes. Two FM-2 wagon drills, using 2-inch Carset Jackbits and working on one of the smaller cuts, are shown at the top.

the neighborhood of 7½ million dollars.

The contract for the job was awarded to The Savin Construction Corporation of East Hartford, Conn., last fall on a bid of $5,250,000 and involves the following major operations: Clearing and grubbing 240 acres of land along the 300-foot right of way; the excavation of 100,000 cubic yards of muck and 1,111,600 cubic yards of unclassified material; the moving of 1,000,000 cubic yards of earth and 600,000 cubic yards of gravel from borrow pits; the paving of the two roadways; and the erection of the toll and administration buildings. Date of completion was set as July 1, 1950.

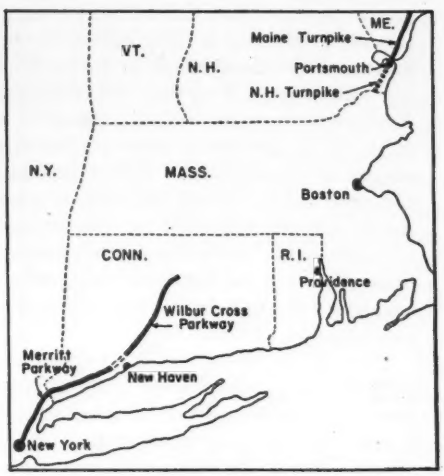
The contractor had originally intended to spend the winter clearing and grubbing the land and doing as much earth and rock removal as he could before the usually rigorous New England winter put a stop to operations. But as it turned out, the weather was frequently mild and sunny and permitted him to bring in earth- and rock-moving equipment to do most of the heavy excavating during the winter months. As a result, he is now some three months ahead of schedule, and the work is progressing rapidly.

In order to obtain the grade desired, it was necessary to make eleven cuts along the right of way. These ranged in depth from 5 to 35 feet and involved the handling of from 5000 to 60,000 cubic yards of material. Solid rock was encountered in many places, a total of 225,000 cubic yards being ledge rock. Elsewhere, the removal of overburden, consisting of dirt with small and large boulders intermixed, presented drilling difficulties.

The contractor deviated from conventional practice in excavating the major cuts. Instead of attacking them with wagon drills and doing the work in a series of lifts, he proceeded to put down large-sized blast holes to roadway grade with an Ingersoll-Rand Quarrymaster drill, taking out the cuts in a single lift. The Quarrymaster is a portable, self-contained rock drill designed primarily for drilling large-diameter blast holes in quarries, open-pit mines, coal-stripping operations, construction projects, etc. It started on the job on December 15, 1948, and has been working steadily since then ahead of the power shovels and rock-moving equipment. The results obtained with it have more than justified its use.

Mounted on tractor treads, the Quarrymaster can travel overland under its own power at a speed of 1 mile an hour and can negotiate grades up to 30 percent. When spotted in drilling position, it is leveled by three hydraulic jacks, two in front and one at the rear. These support the unit while it is operating, preventing interference through vibration and insuring correct hole alignment. It works rapidly, putting down holes up to 6 inches in diameter to depths of approximately 70 feet.

The drilling element is a large-sized piston-type machine that delivers about 200 blows a minute. The drill steel, made



LOCATION MAP

The 15-mile New Hampshire Turnpike, indicated by the heavy dotted line in the right upper corner, will add another link to the 4-lane highway that will eventually extend from New York to Portland, Maine. Existing sections are shown in solid lines. The connection between the Merritt and Wilbur Cross parkways at New Haven is now nearing completion.

miles long and will consist of two 24-foot bituminous-macadam roadways separated by a 24-foot grassy strip. Structures to be erected include seventeen concrete bridges and overpasses, an interchange station complete with tollhouse, and an administration building. The total cost of the project will be in

PHOTO NEW HAMPSHIRE STATE HIGHWAY DEPARTMENT

MIDWINTER EXCAVATION WORK

This view, taken early in February of this year, gives an idea of the unusually mild New England winter that permitted heavy earth-moving machines to operate without interruption. Normally the ground is frozen and covered with a heavy blanket of snow that makes excavating impossible.

of hollow alloy steel 35 feet long and fitted with 5½-inch Carset bits is automatically rotated with each stroke. The hole is kept clean of cuttings by passing air from the drill down through the hollow rod. Vacuum, drawn on a hood that fits around the drill steel at the collar of the hole, picks up the cuttings as they emerge and delivers them through a hose to storage hoppers on the machine.

The 5½-inch Carset bit was developed for the Quarrymaster by Ingersoll-Rand Company. This type of cutting tool has proved itself to be considerably more economical than the regular steel bit in cost per yard, in addition to other advantages. The Carset stays sharp longer, increasing drilling speed as well as over-all productiveness of the machine by eliminating frequent bit changes. Furthermore, the virtual absence of gauge loss insures a hole of uniform diameter throughout. Reconditioning requires only a small hand-held pneumatic grinder operated by compressed air obtainable from the Quarrymaster, thus obviating the handling, sharpening, and heat treating of steel bits in shops at considerable expense.

Two Mobilair portable compressors, stripped of their wheels and running gear and fastened to the frame, supply power for all the operations of the Quarrymaster. A 5-cylinder, reversible-type air motor, with a lifting capacity of 16 tons, raises and lowers the drill on the vertical tower by means of a roller chain. The same motor also serves to lay the tower back onto the machine when the unit is in transit, or when an overhead obstruction in a short haul makes this action necessary, and to raise it again when the new drilling location is reached. Two similar air motors, one on each of the crawler tracks, act through reduction gears to move the unit on the job and give it a high degree of maneuverability. All functions are controlled by the operator in the cab.

Several reasons impelled the contractor to use the Quarrymaster in place of other types of drilling equipment in making the major cuts. For one thing, that equipment and its auxiliaries would have had to be shifted and positioned continually—a time-consuming process—because of the unevenness of the terrain and the presence of stumps, overburden, and other obstructions left in the course of clearing the wooded land. The Quarrymaster, traveling under its own power and carrying its own air supply and accessory equipment, would lose little time in reaching a drilling site and, when finished there, in moving on to the next one. This did not apply to the low cuts, for which wagon drills were considered suitable.

However, the principal factor was that the Quarrymaster, under the prevailing conditions, could effect appreciable savings on a cost-per-yard basis. Following normal clearing and grubbing, no stripping or removal of stumps and burden involving heavy expenditures would be required. Besides, cold and wet weather would interfere little if any with the work because the operator is protected and able to keep the drill in full production in well-nigh any kind of weather. Normally a crew of three men, or under the worst of moving conditions only four, are needed to do all the drilling, loading and blasting, servicing, shifting and spotting of the machine, and sharpening of bits. The operating economies are obvious when three workmen on a bank and one machine are seen drilling and blasting sufficient muck for one 2½-cubic-yard shovel and a fleet of large trucks.

On the turnpike job, Quarrymaster blast holes are spaced on 15-foot centers in solid rock; where overburden is 6 or more feet thick and the rock is very seamy they are drilled on 12-foot centers. Speed of drilling is approximately 8-9 feet an hour in solid rock; in mixed dirt and boulders it is more than 20 feet an hour. The average for the whole job so far has been 10-12 feet an hour. The Carset bits are reconditioned on the job by dressing the cutting faces of the tungsten-carbide inserts with a pneumatic grinder that takes air from the re-

BIG CUT

About 2 miles north of the Massachusetts state line where the last major cut is being taken out. Its maximum depth is 20-22 feet. The picture shows a Bucyrus-Erie power shovel loading broken material into rear-dump Euclid trucks. The Quarrymaster drill is in the distance. It began work about two weeks before the shovel did and has kept sufficiently ahead of blasting to be out of range of damage.

ceiver of one of the compressors on the Quarrymaster. The interval between sharpenings is about 100 feet in very hard rock and 600-700 feet in soft rock and overburden.

Holes are loaded with 25-pound cartridges of Hercules 60 percent special gelatin dynamite. The amount used depends upon the nature of the ground, the depth of the hole, and the number per blast. Each of the two largest shots set off to date took 10,000 pounds of explosives distributed among 44 holes, while 4350 pounds placed in 63 holes sufficed for the smallest cut. The average quantity used comes to approximately 1¼ pounds per cubic yard of material broken.

The Quarrymaster drill works ahead of a Bucyrus-Erie 2½-cubic-yard power shovel which loads 1300 to 1500 yards daily. Both are on a 10-hour-a-day schedule; but at one spot, where exceptionally hard rock was encountered, the big drill was forced to put in twenty hours to keep the shovel busy. The two largest cuts excavated by the Quarrymaster-shovel combination each contained about 60,000 cubic yards of material. The first one, from 18 to 35 feet deep, is finished, and the other, from 20 to 22 feet, is nearing completion.

Dirt and rock scooped up by the shovel is carried to fill areas by Euclid dump trucks, of which there are twenty of the bottom-dump type and ten rear-dump units. Six other power shovels, most of them of 2½-yard capacity, are at work on other sections of the contract. In addition to the equipment mentioned there are six cranes, nineteen bulldozers, twelve Tournatrailers, eight Tournapulls, one Tournadozer, one Euclid loader, six Mack trucks, three trailers, three graders, eleven portable compressors, twelve wagon drills, and two dual-drum pavers. Two portable lighting plants permit night operations when necessary, and two lubrication trucks keep the machinery in top running condition in the field. The total investment in equipment now on the job exceeds two million dollars.

PHOTO NEW HAMPSHIRE STATE HIGHWAY DEPARTMENT

LOADING BLAST HOLES

Workmen loading dynamite into Quarrymaster holes 5½ inches in diameter and 35 feet deep. In each is placed 250 pounds of dynamite of 60 percent strength packed in 25-pound cartridges.

Approximately 265 men are employed on the project. Clearing and grubbing have been completed, and operations are underway the entire length of the highway. The contractor expects to finish excavating and borrow work by July 1, when paving is scheduled to start.

Bituminous macadam 3 inches thick will make up the wearing surface of the traffic lanes and will rest on a 4-inch base of crushed stone, of which some 120,000 tons will be required. The paving job itself will call for the use of 1,700,000 gallons of bituminous material. About 210,000 linear feet of stone curbing will be needed; more than 13,000 cubic yards of concrete will be poured in constructing the traffic circle at the north end of the turnpike and the interchange station near the center, and for other purposes; around 450 catch basins will be provided; and in excess of 101,000 feet of pipe of all kinds and sizes will be used for drainage, etc. The center strip and the sides of the roadway, an area of approximately 500,000 square yards, will be covered with loam and seeded to grass.

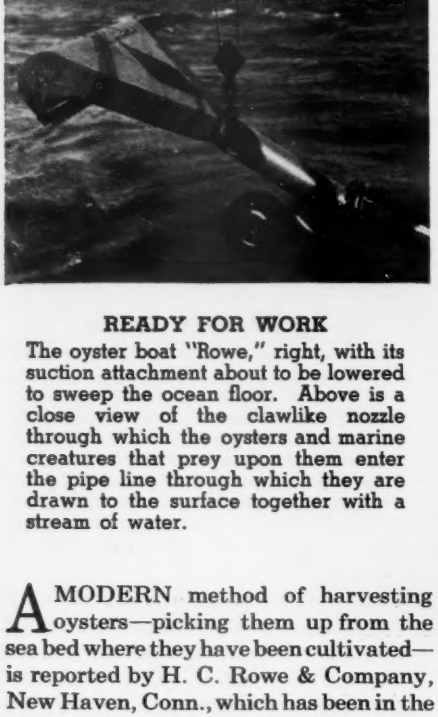
The New Hampshire Turnpike was designed by Daniel H. Dickinson, chief engineer of the New Hampshire Highway Department, and is being constructed under his direction. Mr. A. I. Savin, president of The Savin Construction Corporation, makes frequent trips from the company's offices in East Hartford, Conn., to the scene of operations to check on progress. He commutes by private plane, making him one of the few heads of contracting firms in the country to use this mode of transportation.

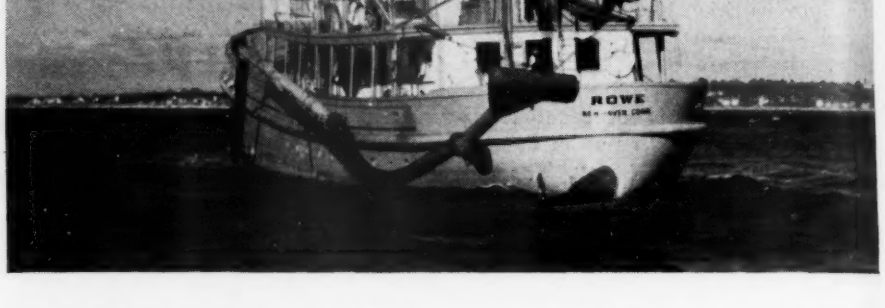
Mr. Savin's staff on the job includes B.A. Wilder, general superintendent; Lloyd F. McCarthy, project manager; Herb Savin, his son, superintendent; Bob Staples, engineer; Bob Work, equipment manager; Simon LaMarre, Jr., master mechanic; L. McKillop, timekeeper and office manager; Ralph Howard, blasting foreman; and Alva Hausenfluck, drill foreman on the Quarrymaster.

"LUBE" TRUCK

One of two trucks that transport greases, lubricating oils, and other supplies to the earth-moving equipment. Each carries an Ingersoll-Rand D-60 portable compressor, minus wheels and gear, that is mounted on the truck bed and furnishes air mainly for inflating tires. Hand-held grinders and other tools permit the making of minor repairs in the field.

Harvesting Oysters with Suction





READY FOR WORK

The oyster boat "Rowe," right, with its suction attachment about to be lowered to sweep the ocean floor. Above is a close view of the clawlike nozzle through which the oysters and marine creatures that prey upon them enter the pipe line through which they are drawn to the surface together with a stream of water.

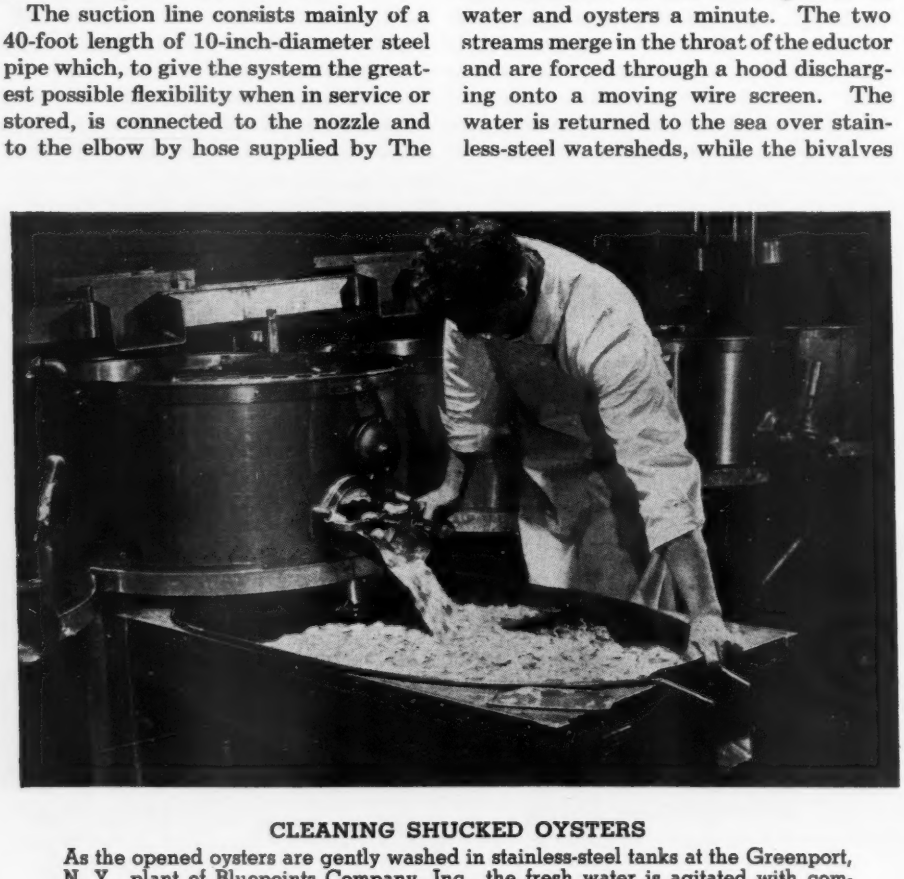
A MODERN method of harvesting oysters—picking them up from the sea bed where they have been cultivated—is reported by H. C. Rowe & Company, New Haven, Conn., which has been in the oyster business since 1868. The equipment used resembles a giant vacuum cleaner and is pulled along by a self-propelled vessel to which it is attached by a long-radius steel elbow. A dredge blade and nozzle, which has an opening approximately 6 feet wide and 7 inches high, travels along the ocean floor behind a dolly with a rubber tire.

The suction line consists mainly of a 40-foot length of 10-inch-diameter steel pipe which, to give the system the greatest possible flexibility when in service or stored, is connected to the nozzle and to the elbow by hose supplied by The B. F. Goodrich Company. The necessary suction is induced by a centrifugal pump that delivers 3600 gpm. with a total head of 180 feet. The flow is converted into a jet that passes into an eductor and creates a vacuum in the pipe line sufficient to lift 2400 gallons of water and oysters a minute. The two streams merge in the throat of the eductor and are forced through a hood discharging onto a moving wire screen. The water is returned to the sea over stainless-steel watersheds, while the bivalves are carried by the wire-mesh conveyor to the ship's loading space.

As the nozzle is dragged along the ocean bottom, virtually everything within its suction range is drawn in, including oyster drills (boring snails), one of the oyster's worst enemies. This pest, the company believes, can be largely eradicated by using the equipment to prepare beds for the planting of spat—oyster seed. Actually, in clearing 40 acres for the purpose, it destroyed more than 50,000 of these creatures, thus materially raising the odds in favor of the survival of the spat and, incidentally, a large marketable yield.

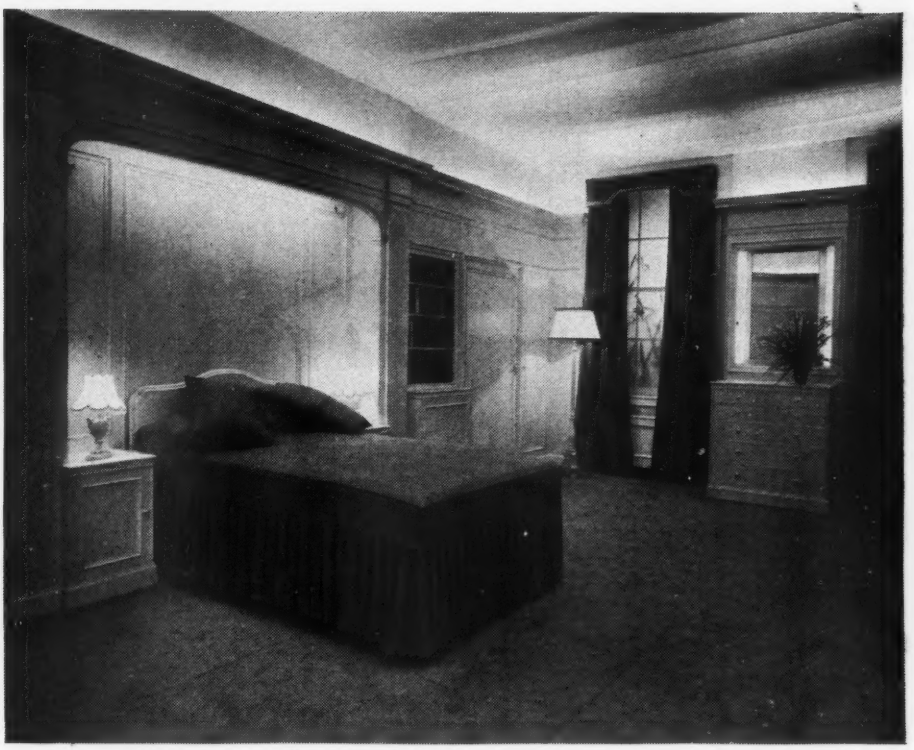
Another advantage of the Rowe suction system is that it is entirely mechanical; once it starts operating, it runs virtually by itself. According to Rowe & Company, less than half the number of men are needed to harvest the same amount of oysters by the new than by the old method. In the case of the latter, steel dredges, dropped over a vessel's side, are pulled up and emptied on the deck, where more workers transfer the haul to storage.

The *Rowe*, from which the suction equipment operates, is a converted Army freight-supply vessel. It is 114 feet long, powered by twin diesel engines, averages 11-12 knots, and has a cargo capacity of 3000 bushels. Unloading is done by bucket and belt conveyors, which discharge the oysters onto a dock conveying system for transfer to a processing plant. The rate of catch is 1000 bushels an hour, and since the ship was put in service it has harvested approximately 225,000 bushels.



CLEANING SHUCKED OYSTERS

As the opened oysters are gently washed in stainless-steel tanks at the Greenport, N. Y., plant of Bluepoints Company, Inc., the fresh water is agitated with compressed air to dislodge particles of shell and other adhering substances.



BEDROOM OF THE DUKE OF EDINBURGH
Hundreds of Glasgow people contributed from sixpence to many pounds each towards this wedding gift from the city to Princess Elizabeth and the Duke of Edinburgh. Preparations began well in advance of actual production with the measurement of the 28x17-foot room in Clarence House and the making of drawings. The Regency paneling and the fourteen pieces of furniture are of selected kiln-dried white Scottish sycamore. Each article was styled by Neil Morris, and 70 men in his furniture factory worked with meticulous care for nine months to get every detail right. Palace authorities were consulted regularly as the suite took form, and the royal couple gave final approval to the furnishings.

Air Power Speeds Furniture Building

William Boyle

COMPRESSED air has done much to bring the ancient art of wood manufacture to a stage where it is now possible to combine quantity production with high-quality workmanship such as is generally associated only with individual pieces made by skilled craftsmen. This conversion from hand to machine methods is well exemplified in the factory of H. Morris & Company, Ltd., of Glasgow, Scotland, where precision engineering, conveyor systems, special jigs and fixtures, and pneumatic tools and equipment have resulted in placing the firm in the forefront in the mass production of fine paneling, furniture, and architectural woodwork for luxury hotels and ocean-going liners like the *Queen Mary* and *Elizabeth*.

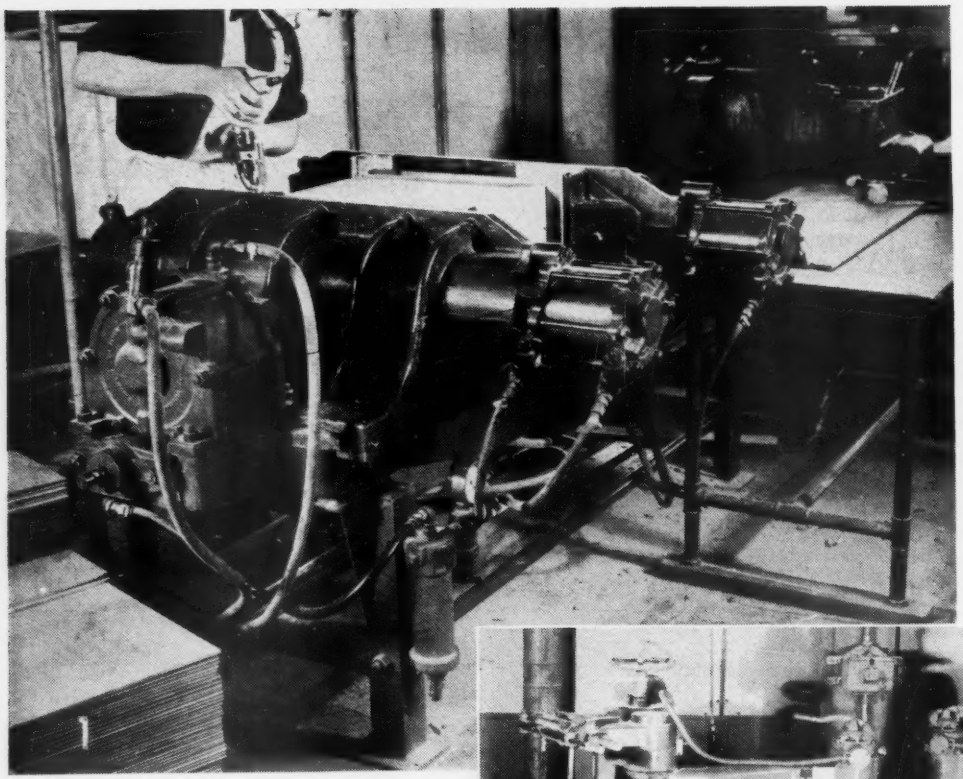
Another contributory factor in this transformation is the "making" of wood itself—laminated wood for purposes where beauty or lightness are sought, and heavy compressed wood for industrial and other uses where strength and toughness are of prime consideration. Because of its modern facilities that enable it to manufacture these materials and to convert them into a great variety of products, the company played an important part during the past conflict when shortages of steel and seasoned lumber threatened to interfere with the war effort. Miles of decking was required for the barges upon which the success of the Normandy invasion depended. Morris helped to fill the breach by supplying plywood decking. Laminated construction served the naval architect in still another way. Made up into thick doors, an especially lightweight wood (ligher than cork) reduced the dead weight of certain ships by as much as 25 tons.

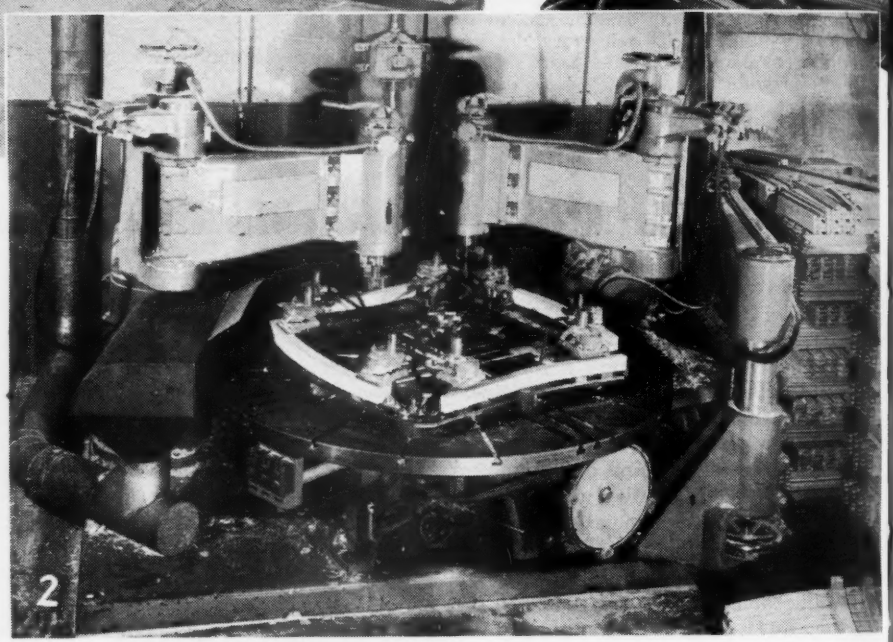
Airplane designers also turned to this weight-saving material, of which huge quantities of boatshaped gasoline tanks were produced by the concern for Mosquito craft. Known as jettison tanks, they were detachable, and each had a detonator in its nose. During flights over enemy territory they supplied the planes with emergency fuel; upon reaching the targets they were released, the residue gasoline being exploded by the detonator on contact with an object. When returning to their bases, the machines drew on the fuel in their own tanks.

Compressed wood is suitable for applications that were hitherto restricted to metal because it can be exposed to stresses such as the latter alone was considered capable of withstanding. The material has been made into gear wheels in the Morris plant and been found to lend itself well to noiseless and oil-less operation. Experiments indicate that there is a wide field for it in the building of textile and other machinery, where metal for certain parts has limitations, and likewise in the manufacture of molds for the plastics industry, to list a few uses.

Helicopter propellers produced by the firm are an interesting example of laminated wood-compressed wood construction. The main spar or stem of the 20-foot blade, which is provided with ribs, is composed of compressed wood, while the blade surface consists of a shell of light laminated wood. The advantages of a propeller of this type were amply demonstrated during the war. In the event of being badly hit by shellfire the blades, having greater flexibility than those of steel, shear off rather than becoming twisted and putting the aircraft out of action, which is liable to happen under such circumstances.

Another phase of the organization's activities is that of bonding compressed wood and metal for parts that have to be both strong and flexible. This is done by combining wood and metal laminations, the latter being perforated with holes that are staggered in relation to one another. By this method the adhesive resin flows unimpeded through the wood and openings in the metal, insuring a firm bond. This construction was used to good effect in attaching the hub to the blades of the helicopter propeller, the connecting members consisting of parallel metal plates laminated into each blade.





VARIED USES OF AIR POWER

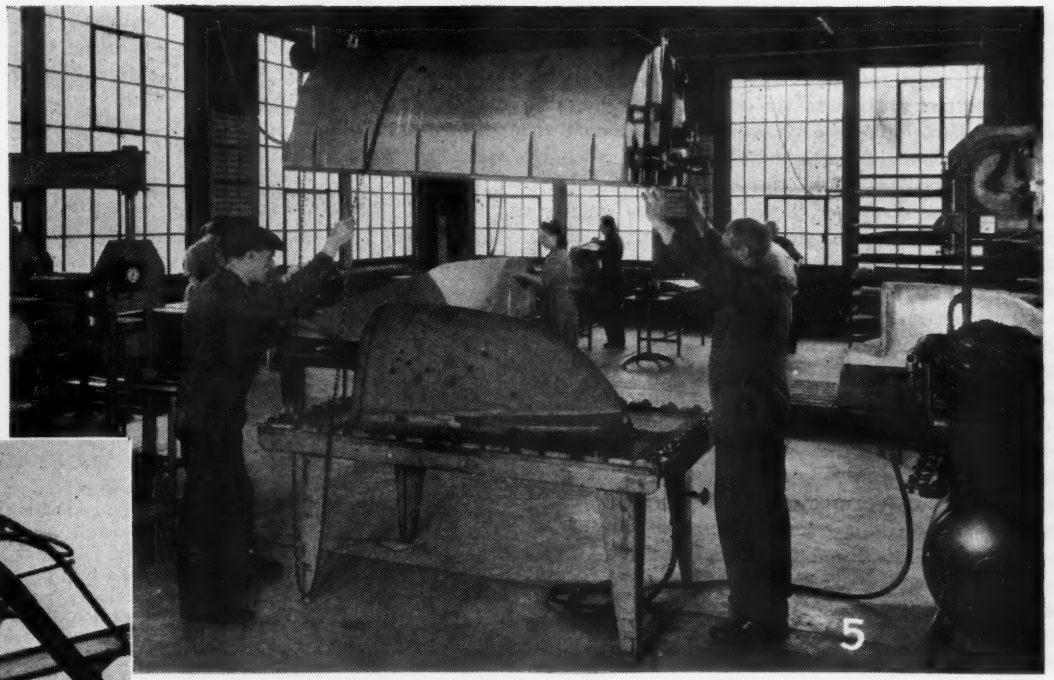
1– The three air cylinders on this machine move clamps in two horizontal directions for gluing dovetailed drawer joints. The side frames can be adjusted to accommodate different sizes. 2– An automatic shaper that gives varying contours to flat pieces of wood mounted above templates on a rotary table. The cutters are kept in contact with the work by pneumatic pressure, and the wood, in turn, is held in place by eight air clamps. 3– An air-operated screw driver speeds the assembly of furniture. 4– This air hoist traveling on a monorail unloads coal from trucks and elevates it to powerhouse bunkers. 5– A small autoclave that was used during World War II to make boat-shaped plywood jettison gasoline tanks for Mosquito aircraft. On the table is the former over which the wood was shaped by air pressure. The hood of the pressure chamber is shown in raised position. Air was supplied by the compressor at the right.

Compressed wood, as well as light plywood, is laminated by Morris in making household ornaments and utensils. Highly decorative edge patterns are obtained by intermingling layers of mahogany, sycamore, French walnut, etc., while fruit bowls and similar articles can be given beautiful surface designs by molding them of interlaced strips of different woods. In the case of the lighter laminated components, 1/80- and 1/64-inch plies are molded to form a solid mass of the desired shape and thickness by subjecting them to hydraulic pressure of 1500 psi. The presses are steam or electrically heated under automatic control, which insures even distribution and proper curing of the bonding adhesive. In manufacturing compressed wood, which involves remaking the structure of Nature's product, pressures of 3500 psi. are applied for periods of from four to six hours.

All-wood laminations must be distinguished from wood veneers with a plastic core, a lower-cost material that has been turned out by some concerns as a substitute. When increased supplies of lumber again become available, products made throughout of plywood are sure to grow in number and give this phase of the woodworking industry a far greater field than it has enjoyed in the past. By means of modern manufacturing methods, as practiced in the Glasgow factory, it is possible to produce quality furniture and other things of laminated construction for the millions in quantity. One of the projects now taking shape in its planning department is the molding of standard pieces of infinite variety and complexity to be carried in stock and used in the making of a wide range of standard-design articles.

Aside from effecting considerable savings in manufacturing time, the material that enters into molded objects does not have to undergo long seasoning such as is necessary in the case of lumber, because the treatment to which it is subjected insures dryness and uniformity of structure and makes it proof against warping. Laminated furniture withstands water and heat, does not come apart, as proved by tests of 72 hours' duration in boiling water.

In addition to the work outlined, the plant is equipped for the fabrication of solid-wood furniture of all kinds on a scale that is amazing. Take chairs, for example. By the methods used it is possible to supply continuously the components necessary for an output of 600-



800 chairs a day. Moreover, the parts for three different models can be run through simultaneously.

Compressed air is the main motive power in the woodworking shops. It is ideal for the purpose because it is clean and safe and easily controlled by hand valves, an important feature where variations in pressure are required. It can be exhausted to the atmosphere without causing damage, eliminating the complicated return piping of hydraulic systems, as well as the fire hazard when oil is used.

The compressor plant is made up of two Ingersoll-Rand Type 30 machines and one Type 40 air-cooled unit, which serves as a standby. Each is mounted on a large horizontal receiver from which the air is piped throughout the factory, including the main engineering department where it serves to operate hoists and the control valves of the hydraulic presses. Elsewhere it is used to power rotary tools such as screw drivers, drills, sanders, polishers, clamping devices, and spray-painting equipment. Flexible, small-diameter hoses deliver it to the points of application at each of which a trap, interposed in the line, catches any water entrained in the air, which is supplied by the compressors at a maximum pressure of 100 psi.

Pneumatic clamps play a vital part in the manufacturing and assembling operations and consist either of individual air cylinders or groups of cylinders set at right angles to one another horizontally or vertically, or both, depending upon the work being done. These usually take air at from 60 to 80 psi., but for some services as little as 10 psi. is adequate. Each unit is controlled by a foot valve, the operator admitting air to the cylinder or cylinders and, in turn, releasing the pressure. The piston stroke is adjustable.

In the cabinet shop, as elsewhere, there are a variety of clamping devices, and the pressures applied are relied upon not only to glue assembled components together but also to squeeze out superfluous glue and leave the thin film that insures the best joint. This calls for nice control, which offers no difficulty with air power.

The carcass clamping machine, for instance, can accommodate large frames of dressing tables, wardrobes, etc., and is adjustable. Turning a hand wheel operates a horizontal screw stem which moves one side of an end cage laterally thus changing its size, while stops in the sides permit varying its height. The cage can be rotated by hand to make the work accessible, and a single horizontal air cylinder exerts whatever pressure may be desired to its movable side to hold the carcass for gluing and for putting in screws with a portable pneumatic tool.

In assembling beds, one of the clamping units used has a table with slots in the edges which permit varying the number and positions of a group of pneumatic cylinders in accordance with requirements. Even in the finishing department there is a large clamping machine with eight cylinders, six ranged along one side and one at each end, to grip long pieces during sanding operations.

Chair manufacture, as has already been intimated, is carried out by production-line methods, the separate components being delivered by conveyor belts to stations for sub- and final assembly. The parts come from the machine shop ready to be put together, except for two dowel holes which have to be drilled in each back leg for the side rail in which the pins are inserted. This is done by placing groups of rails in a metal frame and pushing the dowel pins in by a small pneumatic cylinder. Where the construction calls for it, the rails are reversed and the performance is repeated.

Assembly varies somewhat with the type of chair, but each is generally built of three units, as follows: Back rails, slats, and back legs; front rail and front legs; and the stretcher (H-shaped leg stiffeners) plus side rails. The top and bottom back rails are fastened by tenon and mortise joints to three vertical slats. The components, to which glue has been applied, are placed in a fixed frame in which they are held firmly while pressure is exerted against one rail by a suitably shaped head attached to the piston of a pneumatic cylinder. This assembly and the back legs are similarly joined by the aid of a frame that has a movable side against which pressure is brought to bear by an air cylinder mounted at right angles to the legs, the lower ends of which rest against a stop. The succeeding operations, preparatory to final assembly, are carried out in much the same

manner with specially designed frames and pneumatic clamping devices arranged to meet requirements.

At the last station in the production line, the three subassemblies are put together. This involves making eight joints, four on each side, to connect the side rails and stretcher to the front and back. The side rails are fastened by dowels and the stretcher by tenon and mortise. Four triangular blocks, one in each corner, are fitted in the seat to prevent distortion while the chair is under pressure. The frame for this work is large and is composed of two sections between which the chair is placed upright. The part adjacent to the chair front is of the same height as the latter and moves with the piston of a horizontally disposed air cylinder. The back of the frame is stationary but can be adjusted by two square-threaded screws with chains and sprockets for hand operation.

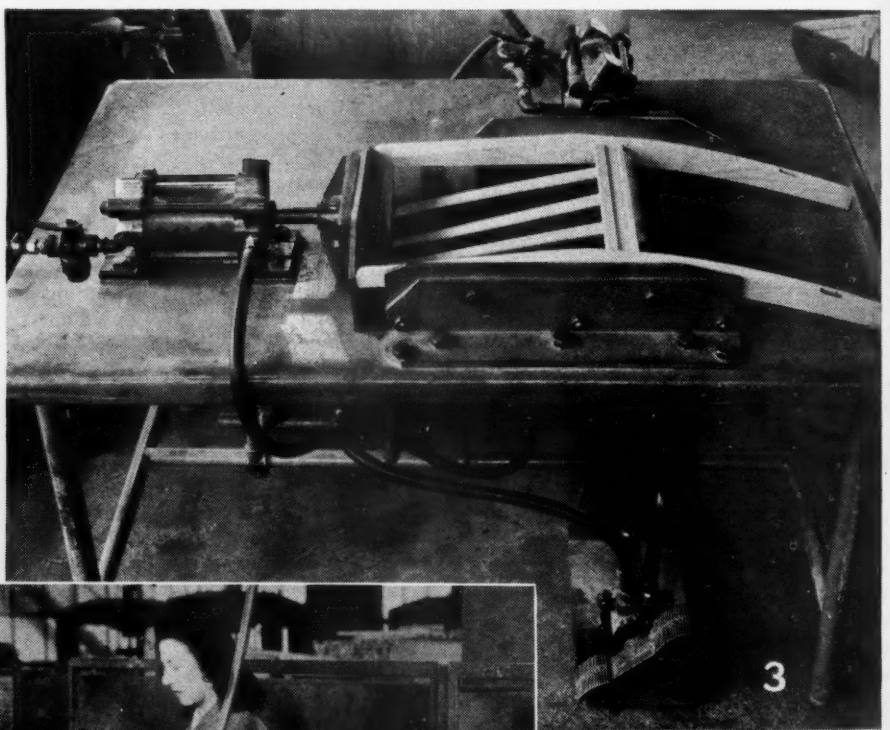
In the upholstery department there is a press for stuffing chair seats. This, too, is actuated by a pneumatic cylinder, as one of our pictures shows. The piston has a 5-inch stroke and carries a flat plate that compresses the stuffing in the seat cover, forcing it against a rubber platen that permits it to expand and fill the seat, which is confined within a metal mold.

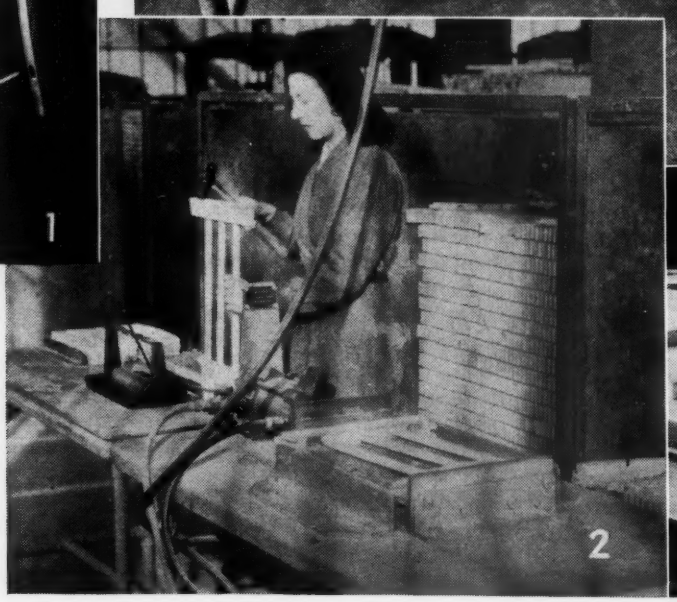
In the machine shop compressed air performs numerous services. Installed there are single and double automatic shapers that are designed to give flat pieces of wood varying contours. The cutters of these units are kept in contact with the work by pneumatic pressure, and the work, in turn, is held in place by pneumatic clamps. It is mounted above guiding templates on a rotary table. A multiple drilling machine in the same shop is provided with four vertical clamping cylinders; and in the case of a veneer saw, the front bar that holds plywood in position while it is being edge-sawed is under pressure from a like source. The back pressure bar and the canting table also are pneumatically controlled. Sawdust produced is blown away by an air gun.

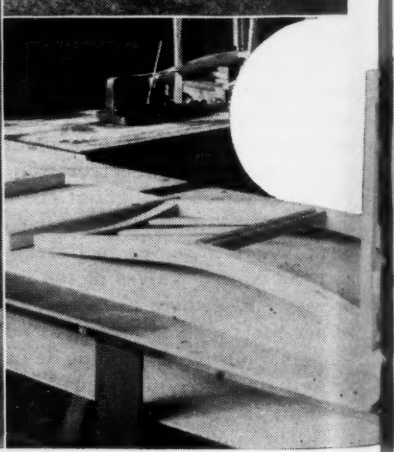
The autoclave or pressure chamber, in which large sheets of plywood are individually given desired shapes, is an interesting example of the use of compressed air. It consists of a former and of a hood which is raised and lowered by an air hoist and has a sealing ring around the bottom to make the chamber airtight. The equipment is served by two compressors driven by an electric motor. The air supplied is stored at approxi-

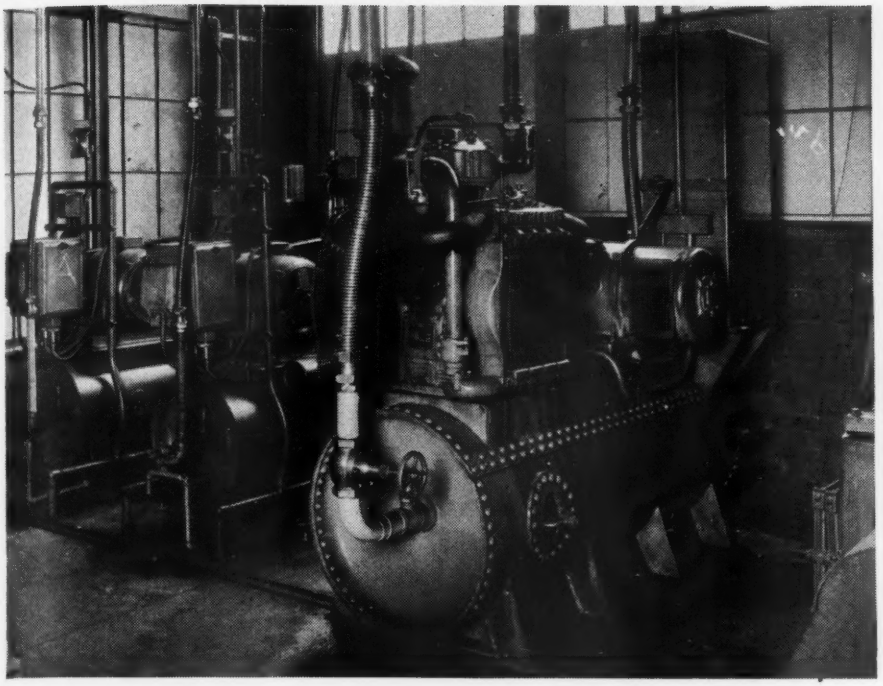
PUTTING A CHAIR TOGETHER

1– Exploded view of a curved-back chair, showing 22 joints that are brought together for gluing in specially designed pneumatic clamping machines. 2– First of the subassemblies, in which top and bottom rails and slats are being squeezed together and glued to form a part of the back. 3– Here the back legs are being added, with air cylinders at the left and top exerting pressure from two directions. The machine is operated by the pedal on the floor. 4– Final assembly is made in the clamping unit in the background. A completed chair chassis is on the conveyor in the foreground. 5– Air pressure from an overhead cylinder is used to stuff chair seats. A flat plate attached to the free end of the cylinder piston forces the cushion against a rubber platen, causing the stuffing inside of it to expand fully and to fill the seat confined within a metal mold. A similar but smaller machine is used to give plywood for movie-theater chairs curved contours.









FACTORY AIR PLANT

Three Ingersoll-Rand motor-driven units—a 25-hp. Type 40 in the foreground and two 15-hp. Type 30 models—supply compressed air at 100 psi. pressure for general use in the plant.

mately 140 psi. in a receiver that is attached to the autoclave and is admitted directly into a rubber diaphragm that presses the sheet against the former. To bring the wood in close contact with the latter, the space between the two is evacuated. When the pressure drops, the compressors automatically cut in to replenish the receiver. A smaller autoclave, generally similar in design, was utilized during the war to shape the jettison gasoline tanks for aircraft mentioned at the beginning of this article.

Plywood sheets are also pressed into angle shapes by means of a bending machine. The pistons of four vertical pneumatic cylinders, about 1 ½ feet in diameter, are connected to the unit's main bending beam and push the latter upward against a roller held in position by screw clamps. The plywood to be bent is kept in contact with the roller by a wooden clamp that is served by three vertical 6-inch cylinders interposed between the large units.

This article would not be complete without some mention of Neil Morris and of the bedroom suite that he designed and built for the people of Glasgow as a wedding gift for Princess Elizabeth and the Duke of Edinburgh. It is constructed of the finest white Sycamore in Regency style and has been installed in Clarence House, the royal couple's London residence. There are fourteen pieces of furniture, which are about 2 inches higher than conventional pieces because the duke is 6 feet 2 inches tall.

Neil Morris at the age of 31 is not only a foremost furniture designer but also the country's youngest head of a large furniture factory, which was founded by his father in 1902. This is partly explained by his years of intensive application in numerous fields pertaining to woodworking. After being graduated from school he was apprenticed to a mechanical engineer, going through the engineering and pattern shops and drawing office. During that training period he also studied heating and ventilating, wood cutting, and art at night. When nineteen years old he went to Germany to work in plywood mills, then to France and Switzerland to familiarize himself with decorative veneers and plywood technique. Not content, he came to the New World to see how things are done here. He toiled for a while as a lumberjack in Canada and then worked in leading shipyards and furniture factories in the United States. With that background, it is not hard to understand why the plant he heads in Glasgow has a reputation for fine craftsmanship.

PHOTO BY J. B. GIBSON

PHOTO BY R. A. MIDTHUN

Shasta Dam Cableway Now a Memory

SHASTA DAM, key structure in the U. S. Bureau of Reclamation's Central Valley Project in California, was completed in 1945, but the work of dismantling the aerial cableway system that played a vital part in its construction was finished only recently. This would normally have been a part of the contractor's job, but circumstances decreed otherwise. The head tower stood in the reservoir area, and it was originally planned to have it out of the way before the impounded water reached its base. However, the urgent need for power during the war period caused a speed-up in operations, and the basin was filled sufficiently to permit generating 150,000 kw. of energy a full five months before concrete pouring was completed.

In the final settlement of the contract, the Government took over the tower, but chose to postpone its dismantling until labor was more plentiful. The job was eventually done by contract, the steelwork being removed to a point below the reservoir's lowest operating level. Thus the tower rising out of the water—a well-known landmark during the past several years—disappeared from view in April of this year.

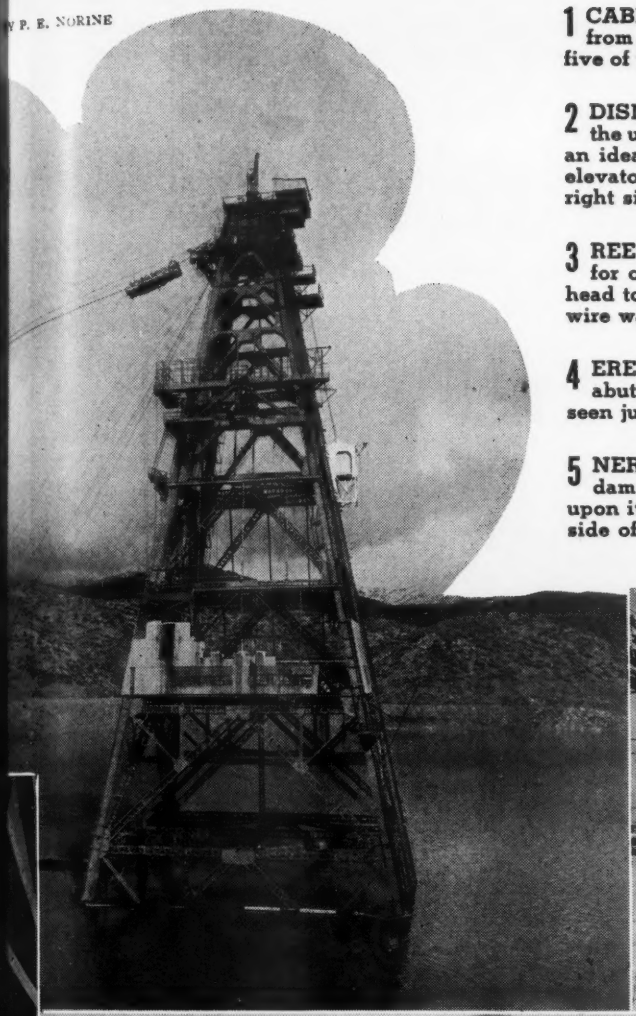
The cableway system didn't get deserved publicity while it was in service because of wartime restrictions. It was the most elaborate carrier of its type ever devised and, incidentally, the final effort of the late Frank T. Crowe, one-time Bureau of Reclamation engineer who, later, attained international renown as general superintendent for the contractors during the building of both the Hoover and Shasta dams. Mr. Crowe is generally credited with having originated the idea of using aerial cableways in dam construction.

The Shasta Dam system was considered Crowe's crowning achievement, and from its 460-foot-high, 4000-ton head tower track cables, 3 inches thick and weighing 22 pounds per linear foot, radiated across the canyon of the Sacramento River to seven individual tail towers each of which traveled on a double set of railroad tracks. By shifting the towers as desired, it was possible to deliver concrete and other materials to every part of the dam and powerhouse areas. A network of lines for moving the carriages on the track cables, slack carriers to prevent the lines from fouling, and other lines to raise and lower concrete buckets brought the length of cable to 25 miles.

The head tower had four structural-steel legs, each 40 inches square, that were laced together with various cross and diagonal members. These corner legs extended to bedrock as much as 102 feet below ground and enclosed almost an acre at the surface. The excavations were backfilled with concrete, and the top of the tower was capable of withstanding a pull of 1000 tons. The motors and hoists for the seven cableways occupied a room 95 feet square and 130 feet high at the 250-foot level. From the drums the cables ran upward and over sheaves at a point 200 feet below the top of the structure.

Seven operators—one for each cable-

Y P. E. NORINE



1 CABLEWAY IN OPERATION. The 460-foot-high head tower as seen from underneath the trestle for tail tower No. 6. Carriages are visible on five of the seven lines. Picture was taken on September 27, 1940.

2 DISMANTLING HEAD TOWER. Almost all the sheathing that enclosed the upper part has been removed. Comparison with picture No. 1 will give an idea as to how much of the base was inundated by the reservoir. The elevator that transported men and materials up and down the tower is on the right side of the structure.

3 REEL OF TRACK CABLE. On May 8, 1940, three-inch locked-coil cable for cableway No. 1 was strung from the left abutment of the dam to the head tower. More than half a mile of the heavy (22 pounds per linear foot) wire was required.

4 ERECTING HEAD TOWER. View taken December, 1939, from right-abutment waste dump. One tail tower on the opposite abutment may be seen just right of the head-tower base.

5 NERVE CENTER OF SKYWAY. Top of the head tower as viewed from the dam crest, July 10, 1943, showing the multiplicity of wires converging upon it from the seven aerial tramways. The battery of floodlights on the side of the tower helped to illuminate the construction area for night work.

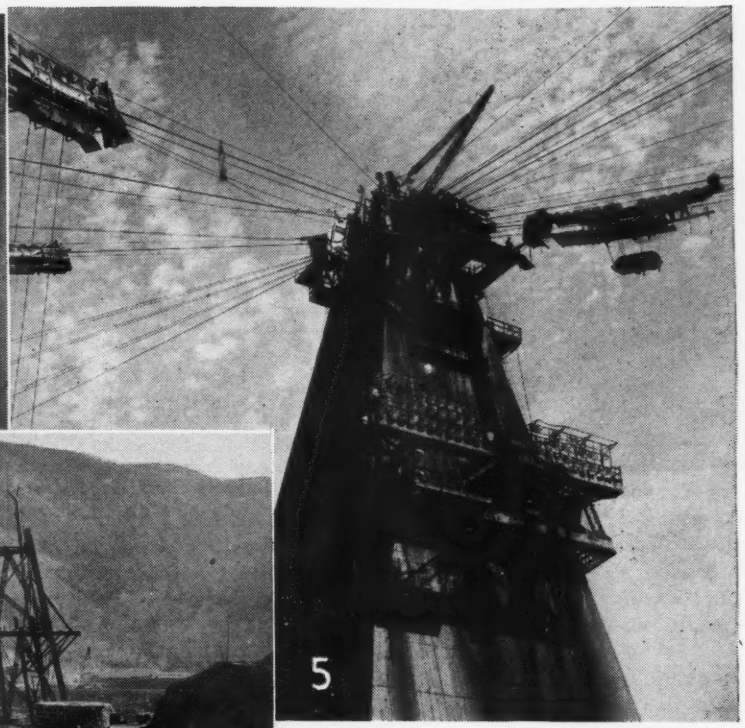


PHOTO BY B. D. GLAHA

PHOTO BY D. A. HOVEY

way—were stationed in booths 18 feet above the hoist-room floor and along the face of the tower where they could look out at their respective tail towers. Aside from them, only two or three oilers were in evidence when the system was functioning. The crews traveled to and from their lofty working perches via an elevator that ran on rails on the outside of the structure.

In addition to the operators, each cableway was manned by a signalman, stationed at or near the point of delivery, and by a hook tender. The latter attached and removed cable slings from loads other than concrete and rode the high line with his cargo. His services were not required when concrete was transported, as the buckets were dumped by the operator in the head tower. The signalman directed all placing, communicating by means of telephone and bell with his towerman. The pouring point was often out of sight of the latter, but he awaited instruction in any event. Buckets were loaded near the base of the tower and within his sight, and he landed them there without direction from an external source.

The buckets, 6 feet square and 8 feet high, each carried 16 tons of concrete and, all told, deposited 6½ million tons in this second-largest man-made structure. From July, 1940, until December, 1944, the head tower was the nerve center of the huge construction project. On August 9, 1941, the cableways placed 11,790 cubic yards of concrete in 24 hours, setting the existing record for this type of work.

Acknowledgment is made to the U. S. Bureau of Reclamation and its publication, *Reclamation Era*, as well as to Robert Midthun, chief guide at Shasta Dam, for the data and photographs.

NEW COMPRESSOR STATION

The station was planned for pleasing appearance and low maintenance costs. Both the main building and the small structure at the right, which houses the regulating equipment, have rigid trussless steel frames and Transite sides and roofs that require no painting. Subsoil conditions necessitated driving more than 50 concrete piles to an average depth of 43 feet to support the buildings. In the case of the old plant, piping was buried and consequently subjected to the corrosive action of salt water. Here it is all above ground on a concrete mat and protected with a red-lead primer and two coats of aluminum paint. Valves and connections are accessible for maintenance and repair.

New Compressor Plant for Long Beach, California, Gas System

THE city of Long Beach, Calif., has interests in more than 500 oil wells in the Wilmington Field, which is partly inside and partly adjacent to its southwesterly limits. The casing-head gas produced with the oil is stripped of its liquid hydrocarbons in three natural-gasoline absorption plants and is then distributed throughout the city for domestic and industrial use.

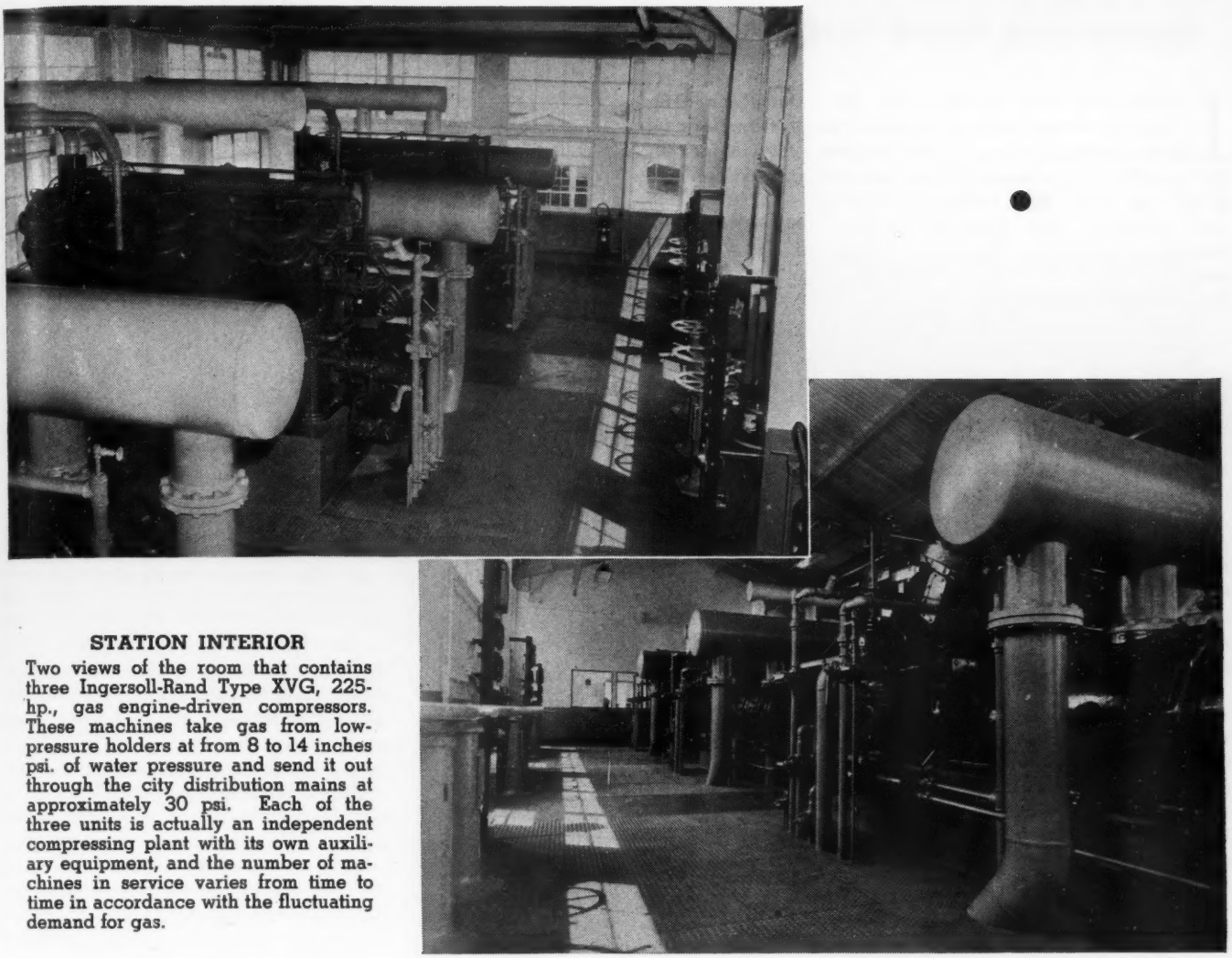
Gas consumption varies widely from season to season and also from hour to hour daily, and means had to be provided to meet these fluctuating service conditions. The volume and pressure of the gas coming from the processing plants remain fairly constant throughout each day, whereas customer demand is never uniform. Consequently, during periods of low consumption there is an excess of gas coming from the wells, and this is stored in holders as a reserve to be drawn upon when the rate of consumption exceeds that of the supply from the wells.

The gas leaves the absorption plants at 30 psi. pressure, which is also the maximum transmission pressure in the city distribution mains. A small percentage of the volume stored is held at this pressure, but most of it is reduced to from 8 to 14 inches of water pressure and held in low-pressure holders. When the latter is withdrawn, it must therefore be compressed to bring it up to the 30 psi. maintained in the distribution lines and must be handled at whatever rate necessary to meet the variable customer demand. With low-pressure tanks having a maximum capacity of 17,500,000 cubic feet and four high-pressure tanks containing 2,000,000 cubic feet, the Gas Department is well equipped to give first-class service at all seasons and at all hours of the day.

The territory is served by 520 miles of distribution mains and is divided into 48 districts. At a strategic location in each district an automatically controlled regulator station reduces the transmission-line pressure to 6 psi. These stations control the flow of gas to customer service lines, maintaining adequate supplies regardless of fluctuating demands that tend either to increase or decrease the line pressure from time to time.

Two of the low-pressure holders are at Compressor Station No. 1. As the latter's gas-compression equipment had become obsolete, it was decided to install a new compressor plant and controls. As a result, the recently completed station bears little resemblance either in appearance or mode of operation to its predecessor, a steam plant built prior to 1920 and containing some outmoded gas engine-driven compressors.

The new station is designed to handle nine million cubic feet of gas a day, the



STATION INTERIOR

Two views of the room that contains three Ingersoll-Rand Type XVG, 225-hp., gas engine-driven compressors. These machines take gas from low-pressure holders at from 8 to 14 inches psi. of water pressure and send it out through the city distribution mains at approximately 30 psi. Each of the three units is actually an independent compressing plant with its own auxiliary equipment, and the number of machines in service varies from time to time in accordance with the fluctuating demand for gas.

intake pressure being equal to that of the gas holder and the discharge pressure not exceeding 30 psi., gauge. Factors entering into the design were the greatly fluctuating demand and the need of maintaining definite pressures on certain feeder mains regardless of the volume of gas passing through them. To meet these requirements and to do so with a minimum of equipment, the load was divided among three gas-compressor units and an unloading system was incorporated in order to take care of variations in demand.

The compressors selected for the job were Ingersoll-Rand 6XVG-1, 4-cycle, gas engine-driven units. Each of these has six 11x12-inch engine cylinders that operate on natural gas and three 19½x12-inch cylinders for compressing the gas, the power rating being 225 hp. at 350 rpm. The compressor cylinders are built with a large clearance between the cylinder head and the piston at the end of its stroke so that they will unload themselves when the demand for gas falls off and the compression ratio increases. This simple expedient was chosen in preference to clearance pockets and/or valve lifters that function automatically with variations in discharge pressure. Engine speed can be reduced to 50 percent of normal full speed by an automatic control actuated by the discharge pressure, thus making it possible to maintain a predetermined pressure on a distribution line irrespective of fluctuations in requirements.

Each of the compressor units has its own auxiliary equipment such as pumps for circulating jacket water, oil, and for gas cooling and is actually a separate plant, independent of the others, capable of handling continuously from 1,500,000 to 4,500,000 cubic feet of gas at a discharge pressure ranging from 15 to 30 psi., gauge. Because of the availability of large quantities of water in the gas-holder tanks, it was not necessary to erect a cooling tower. Instead, water is drawn from them as needed and circulated through the cylinder jackets of the units.

Another respect in which the new plant differs from the old is that the controls are installed in a separate building in order to minimize the noise incident to pressure reduction. The station's gas-transmission problem is somewhat complicated. During a part of the day the gas holders are filled and gas is simultaneously transferred from one section of the distribution system to another. At other times, gas is transferred while the compressor units are pumping gas from the holders into the transmission feeder lines. Much equipment is needed to regulate these movements, and all of it is remote-controlled from the office in the main plant.

In the old station, the yard piping was buried and often immersed in salt water. To prevent corrosion, all piping was dug up, placed above ground, and covered with a red-lead primer and two coats of aluminum paint. An added advantage of this arrangement is that all valves and connections are in sight, thus not only facilitating operations but making them easily accessible for maintenance and repair.

A further improvement is the standby generating unit that has been provided to insure continued service in case of failure of the plant's electric-power supply. It consists of an Electric Machinery Company 50-kw., 220-volt generator driven by a Waukesha 75-hp. gas engine, and has sufficient capacity to operate the pumps and to carry the lighting load in times of emergency.

The cost of the entire station was approximately $275,000. Layout and installation were under the supervision of Samuel L. Spencer, superintendent of production for the company.

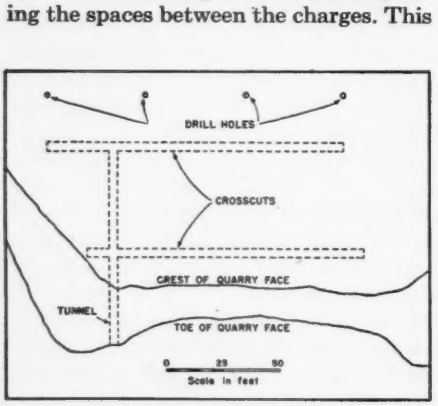
Quarrying Hard Trap Rock

LOCATED near Quakertown, Pa., the Rock Hill Quarry of the General Crushed Stone Company is characterized by one of the hardest types of rock in the country. An igneous formation designated as high-grade trap rock, it is extremely dense and compact and presents special quarrying problems. These are being met by a combination of improved drilling and blasting practices.

The quarry supplies crushed stone for commercial use. It was formerly worked with well drills, but because of the nature of the rock progress was slow and only 9 inches an hour could be obtained. As demand for its products increased, it became apparent that a speedier method of operation would have to be adopted. As a result, the present procedure was introduced and has been in use for about fifteen years. Known as coyote blasting, it involves the driving of small-sized tunnels into the base of the working face and from them advancing crosscuts that are loaded with explosives and fired.

One recent blast broke up approximately 200,000 tons of rock. The entry tunnel was 3x4 feet in cross section and 82 feet long. At a point 42 feet in from the portal, a crosscut was driven 110 feet to the right and 9 feet to the left. Where the tunnel ended, a second crosscut extended 100 feet to the right and 26 feet to the left. A row of four holes, each 9 inches in diameter and 85 feet deep, was then put down along the top of the working face to shatter the upper part of the formation.

Around 61,000 pounds of explosives was used for the blast. It was divided into a number of charges that were spaced along the crosscuts and in the drilled holes. Hercules Gelamite and Hercomite were utilized—the Gelamite in cartridge form was loaded in the drill holes and the Hercomite in bags in the crosscuts. Minus ⅛-inch stone screenings from the quarry's crushing plant served as stemming in the crosscuts, filling the spaces between the charges. This material was formerly put in loose, creating dust and ventilation problems, but is now packed in paper bags. This change has effected a saving in loading time alone of approximately 30 percent.



BLASTING DIAGRAM

Plan drawing showing extent and location of the underground powder galleries and their relation to the vertical drill holes farther back from the face.

Work was further facilitated by installing a 2-way roller-type conveyor track in the tunnel for the transportation of both explosives and stemming material. Operations were begun at the far ends of the crosscuts and progressed toward the entry tunnel. When loading there was completed, the tunnel itself was filled with stemming, the conveyor being removed section by section as the crew approached the tunnel portal.

Jackhamers equipped with Carset bits were used to drive the tunnels and crosscuts and also served to drill holes in large pieces of broken rock for secondary blasting. The Carset bit is especially well adapted for work in hard rock because its tungsten-carbide inserts enable it to outdrill by far conventional types of steel bits.

About once every two years the company sets off a blast such as has been described. All possible precautions are taken to protect workmen from injury during firing, as well as from all other operations. That this program has paid dividends is shown by the bronze plaque that was presented to the Rock Hill Quarry for taking first place in the 1947 National Crushed Stone Association Safety Contest conducted by the U. S. Bureau of Mines. To win the award, employees at the quarry put in 93,869 man-hours without a lost-time accident.

BLAST AND RESULT

A coyote-hole blast brings down about 200,000 tons of rock, including large boulders that require secondary blasting. The workman shown at the left is drilling shallow holes for this purpose with a J-40 Jackhamer and Carset bits.

The General Crushed Stone Company, with central offices in Easton, Pa., owns and operates sixteen crushed-stone and bituminous-concrete plants in New York, Pennsylvania, Massachusetts, and Delaware; two sand and gravel plants in New York; and two agricultural-limestone plants in New York. Otho M. Graves is president; O. E. Benson, vice-president and general manager; John Rice, Jr., vice-president; Redington Moore, secretary and treasurer; M. Bovee, general superintendent; and E. E. Dotter, assistant general superintendent. E. Z. Cole is superintendent of the Rock Hill plant. For the past several years the tunnel blasts have been under the technical direction of Milo Nice of the Hercules Powder Company.

QUARRYMASTER DRILL

At two of its quarries the company uses these self-contained, air-operated units for putting in deep blast holes.

New Mill Makes Stainless and Alloy-Steel Strip

TO MEET the fast-growing market for stainless, alloy, and high-carbon hot- and cold-rolled strip products, the Midland, Pa., Works of the Crucible Steel Company of America has put into operation a unique $18,000,000 plant that will specialize in stainless, the hardest of steels to process. The mill was designed to permit handling steel on an integrated flow plan from ingot to finished product under one roof covering an area of more than 535,000 square feet.

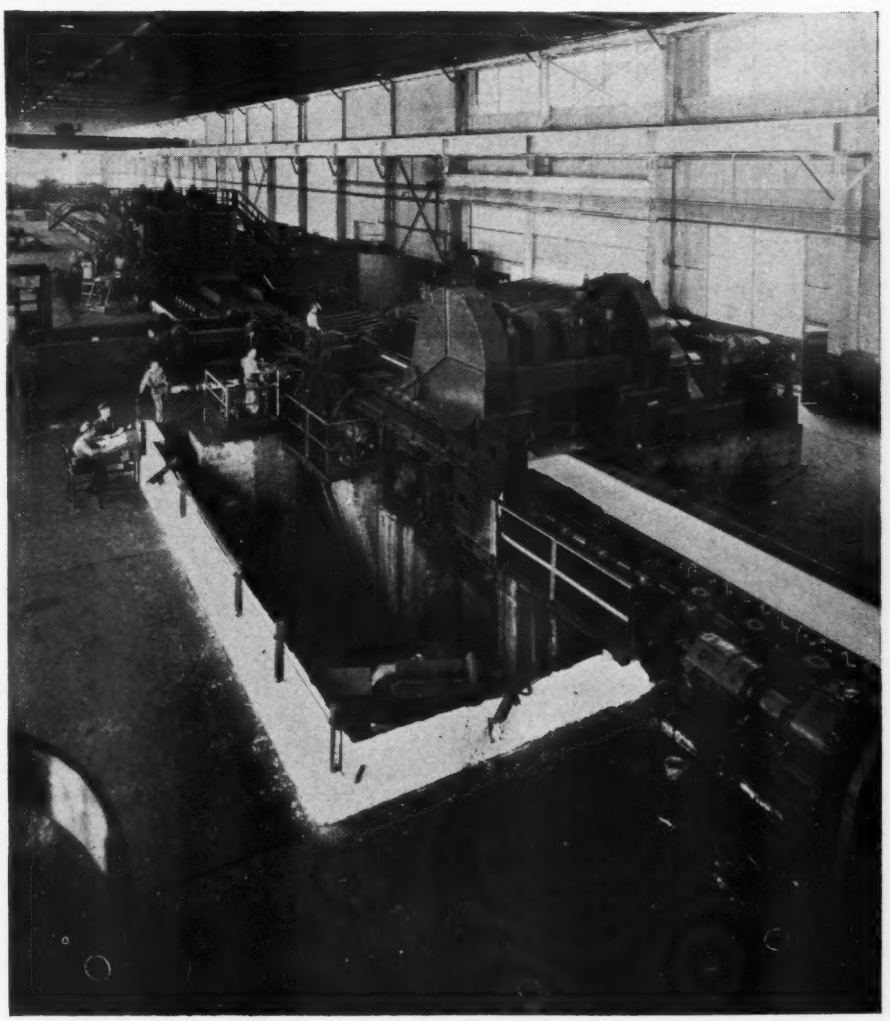
Throughout much of the plant the strip "carries itself" as it uncoils in a series of process steps and recoils at the other end with the aid of the latest developments in automatic controls and mechanical devices. The outstanding feature of the entire layout is a hot-rolling mill with 66-inch-wide working rolls and with its own auxiliary furnaces to keep steel hot during processing. The only one of its kind operating in the United States, it goes by the name of 4-high reversing hot-coiling mill. As it rolls, it coils the strip onto reels, or giant spools, enclosed in gas-fired furnaces on each side. Thus the steel is kept hot for a series of passes between the rolls, each pass reducing the thickness of the strip. Stainless and alloy steels could otherwise not be hot-rolled continuously by a single stand of rolls.

Because of the unique materials flow plan on which the plant was designed and built, it is possible to follow an ingot or slab through all the hot-rolling, annealing, and cleaning operations and, a short time later, see strip uncoil far down the line into one of four cold-rolling mills. A special tandem cold-rolling mill, consisting of three stands of rolls, first passes the unheated strip through successive stands for three reductions in one pass, and then it goes through the other mills—the entire equipment representing highly adaptable finishing facilities by which sheet and strip can be controlled to a fraction of a thousandth of an inch. Scores of auxiliary machines to slit, cut, square, weigh, measure, surface finish, and otherwise process the steel produce the countless combinations of grade, gauge, and finish demanded by industry.

The importance of the new Crucible Steel Company development is disclosed in the following summary of a few of the end products of the stainless, alloy-sheet, and strip steel. The plant serves the automobile, aircraft, railroad, and transportation industries by providing sheets and strip for working parts, bodies, trim, interiors, etc. Special steels are produced for the chemical, dairy, food, paper, fabric, and other industries, as is steel for tank cars and trucks, for process equipment such as vats and tanks, and for the thousands of applications where cleanness and resistance to heat and corrosion are vital factors. Sheet and strip from the new mill goes to the makers of many articles for the home, including cooking utensils, kitchen equipment, household trim and counters, television receivers, and appliances. Untold additional uses are foreseen as new things come into being through the joint efforts of manufacturers and the operations and product-development staffs of the special sheet and strip-steel center.

MIDLAND WORKS, CRUCIBLE STEEL COMPANY

In the foreground of the aerial view, above, is the new sheet and strip mill that is ¾ mile long. The hot-rolling line is shown below. The large machine in the foreground is a slab shear, with a scrap pit left of it. The next, large unit is a 66-inch-wide, 4-high reversing hot-rolling mill for stainless, alloy, and special-purpose steels. Beyond it, the strip produced on the hot-rolling line is coiled for further processing.



TIDBITS FROM CORN

SCHOOL children and cocktail addicts, who are always willing to try something new, head the list of customers subsidizing a "nibble" that is giving the peanut and pretzel a run for their money. "Cornnuts" is the name of the product that has fairly recently joined corn chips and other cereal tidbits, and it is made from whole grains of corn in the model plant of the Olin Manufacturing Company in Oakland, Calif., which is owned and operated by Albert F. Holloway. By his patented process the rich germ in each kernel is retained, and parching of the corn in deep fat is accomplished without appreciable penetration of the vegetable oil used, factors that give Cornnuts their distinctive texture and flavor.

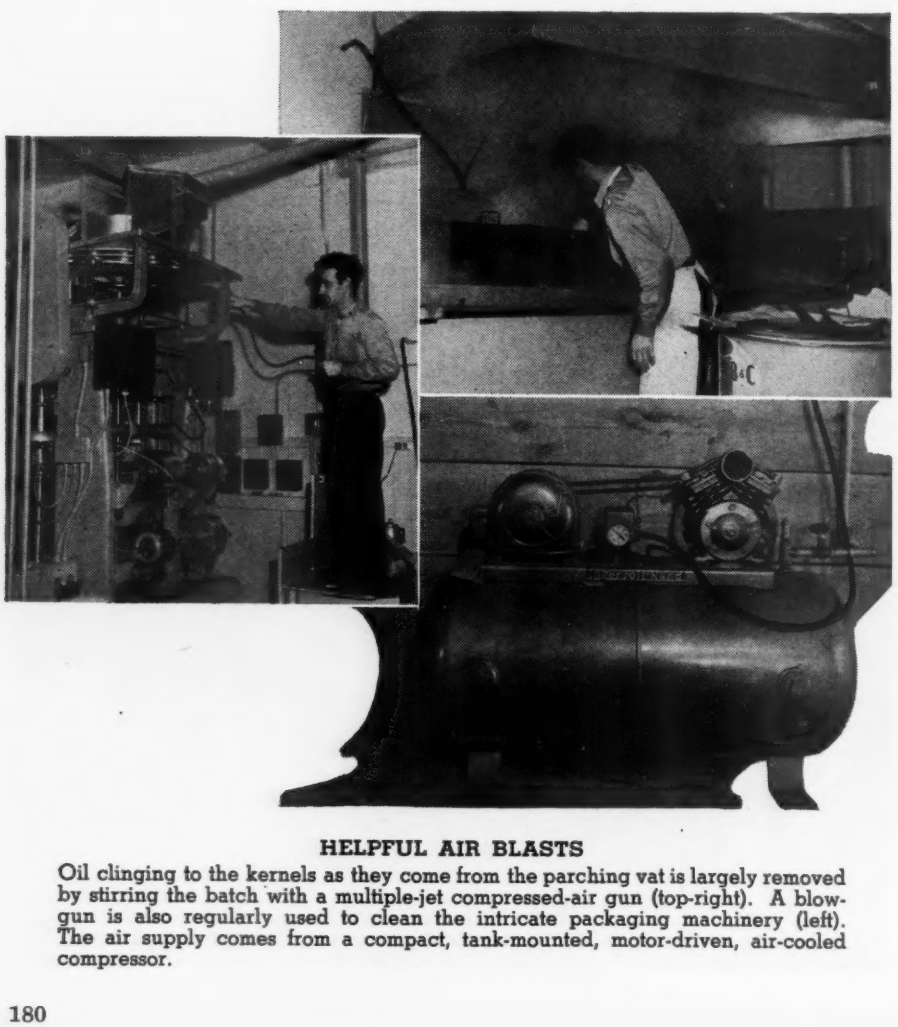
A grade of white hominy corn, which grows largely in the southern states, is bought in carload lots and is processed at the rate of approximately one carload a month. In preparing hominy, the hulls are removed by soaking in a caustic solution that penetrates the kernels deeply and is then leached out by protracted immersion in changes of clear water. Considerable erosion of the kernels results, and the germ is separated along with the hull. Holloway's blanching method, on the other hand, builds up the moisture content of the grains before the caustic is introduced so that penetration is superficial and subsequent removal simplified.

In the Oakland plant, batches are treated in a rectangular, open tank with a perforated false bottom and with gas-fired flues. The temperature of the water covering the corn is gradually increased throughout a 2-hour period to 160°F., when the caustic solution is added and permitted to act for 1½ hours. Separation of the loosened hulls is effected by turbulence created by water jets and sudden draining of the tank by a 6-inch line, the water meanwhile being changed five times. The batch is then dipped into twin 96-cubic-foot vats and allowed to stand some eighteen hours for thorough distribution of the absorbed moisture.

The blanched corn is parched in steel-mesh baskets that are immersed in vegetable oil maintained at a temperature of 175° by gas-fired equipment. The oil, which is the expensive item in processing, is an excellent cooking agent, and its penetration into and adherence to the product are reduced to a minimum. This is as vital as the avoidance of sogginess in doughnuts and French fries.

Immediately upon removal from the parching tank, the baskets of corn are placed on a stainless-steel drainboard, and oil then clinging to the kernels is blown off by compressed air applied by a multijet gun. The air is furnished by an Ingersoll-Rand Type 30 compressor mounted on a horizontal receiver from which it is piped to the kitchen and also to the packing room, where it is indispensable in keeping intricate machinery functioning smoothly and in sanitary condition.

After the product has cooled it is salted and fed through a chute at the end of the cooling table into an automatic, electrically powered skip that discharges it into an elevated storage bin—this novel arrangement having been suggested by apparatus used for handling concrete aggregates. From the bin it flows by gravity through chutes to the packaging equipment. The most elaborate and labor-saving of these devices is a Stokeswrap Model-BS automatic machine with photoelectric control that uses twin webs of cellophane and delivers 60 one-ounce, heat-sealed bags per minute. These are packed 24 to a carton, which are wrapped and heat sealed in waxed paper by a Hayssen Model 5-11 unit. In addition, Cornnuts are put up in a vacuum-sealed 8-ounce can with a reclosable lid and, for bulk-vending machines and nut-store trade, in 5-pound wax-lined Kraft bags. All are distributed through brokers and jobbers so far in nine western states.



HELPFUL AIR BLASTS

Oil clinging to the kernels as they come from the parching vat is largely removed by stirring the batch with a multiple-jet compressed-air gun (top-right). A blow-gun is also regularly used to clean the intricate packaging machinery (left). The air supply comes from a compact, tank-mounted, motor-driven, air-cooled compressor.

Air Power Expedites Boring of Holes for Pole Anchors

FINISHING A HOLE

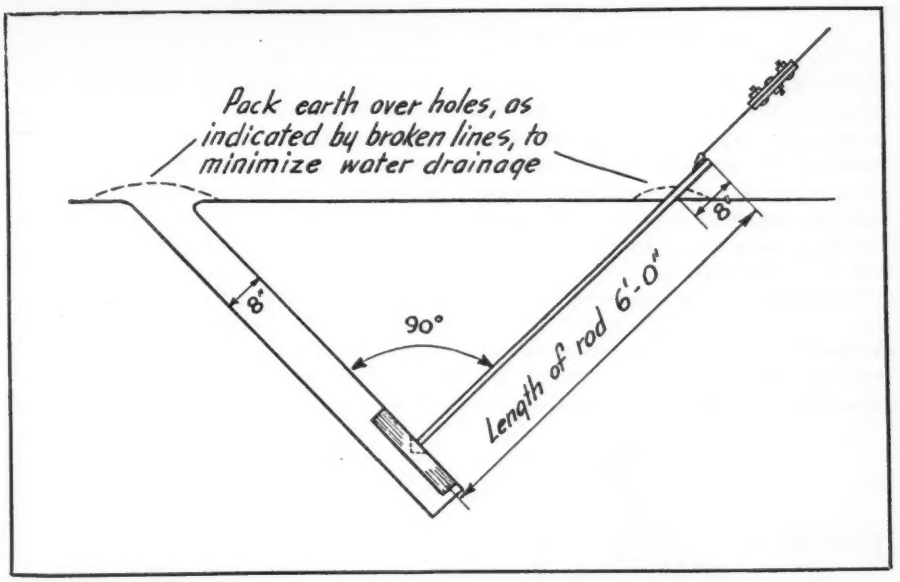
Above, the auger is about to be withdrawn by tackle after completing a hole. The sketch shows details of an anchor installation.

BY ADOPTING air-powered equipment for boring holes in which to lodge anchor plates for wood-pole guy lines, the Manitoba Power Commission has materially reduced the cost of extending electric service to rural areas in that Canadian province. The work involves putting in two holes that meet underground at a right angle, as shown in the accompanying sketch; installing a rod in one hole; attaching an anchor plate to it; putting the guy in place; and backfilling the holes. In clay or other solid soil, the plates used measure 6x15 inches, and those placed in wet or sandy locations are 8x24 inches in size.

By the previous hand method, three men traveling with their tools in a ½-ton truck bored an average of eight pairs of 9-inch-diameter holes per day. Last year the commission was faced with the task of putting in 15,000 anchors in a 6-month working season and determined to seek a faster method. After different types of post-hole augers had been investigated and rejected for one reason or another, it decided to devise equipment and, following a period of trial and error, chose an air-operated auger receiving power from a 105-cfm. compressor mounted on a tractor. On the rear of the tractor is a 9-foot boom from which is suspended a 74-pound air motor and a 7½-foot auger drill steel. Provision is made for raising and lowering them by means of a line run up the boom post from a hand-operated winch.

In average Manitoba soil the weight of the motor and auger is sufficient to feed the latter at an efficient rate, and it has been found that tree roots up to 1½ inches in diameter can be cut through and that stones 3 to 4 inches in size will not seriously interfere with boring. After a hole has been bottomed, the motor is stopped for an instant while the auger is lifted slightly and then restarted and withdrawn. This results in a clean hole with well-defined walls.

Two men operate the rig and are followed by three in a truck who do the installing. It takes only two minutes to drill a hole, but as the average requirement per farm is but three anchors and the farms are widely scattered considerable time is spent in traveling between jobs. The tractor can run twelve to fifteen miles an hour on highways and negotiate ditches and rough terrain to reach all working sites. Last summer the unit averaged 42 holes a day. It was computed that the new method saves $1.20 per anchor.



Rain Repellent for Airplane Windshields

SEVEN years of research are back of a rain repellent for aircraft windshields invented by Dr. D. F. Stedman, Division of Chemistry of the National Research Council of Canada. It is a wax preparation that is being manufactured and marketed as FC-10 Rain Repellent by a Canadian firm. It is said to prevent optical errors the extent of which varies considerably with the size of the drops, the amount of water, the air speed, and the angle of the windshield. Simulated flight tests have revealed that the average error is 5° in angle in the line of vision, which means that a mountain peak half a mile ahead of a plane flying through a downpour might appear to the pilot as much as 200 feet lower than it actually is.

Upon impact with a windshield coated with the preparation, the drops of water are broken down into tiny droplets which pass off into the air stream so rapidly that they are invisible. The windshield therefore appears to be dry and permits vision free from distortion or ripples. Objects 2 miles distant, that remained invisible under certain conditions when viewed through an untreated surface, were in plain view when the wax repellent was applied to the glass. It is said to be satisfactory at air speeds even in excess of 600 miles an hour, and in the heaviest rain. It does not shed ice, but does not interfere with normal de-icing either with heat or alcohol. Materials used are noncorrosive and do not damage paint finishes.

This and That

Power for "Inch" Line Compressors

One two-hundred-eightieth of all the electric power produced in the United States this year will be used in transmitting natural gas through the 1500-mile Big Inch and Little Inch pipe lines that extend from Texas to the Atlantic Seaboard. Most of the energy is required to run motors that operate more than 100 centrifugal-type compressors in fourteen of the 21 booster stations on the lines. Compressors in the remaining stations are driven by gas engines. The year's consumption of power will exceed one billion kilowatt-hours, according to W. T. Thagard of Texas Eastern Transmission Corporation which operates the lines.

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Paging Building Bosses

Steelwork for the first of a group of buildings that will be the permanent home of the United Nations is rising on part of a 17-acre plot on the east side of mid-Manhattan Island, New York City. The initial structure, the Secretariat Building, will be unusually narrow for its height of 42 stories, and its steelwork will embody what is reputed to be the largest wind-bearing connections ever developed. The total weight of the steel framework will be 13,000 tons.

To expedite operations and save steps, the contracting firm, Fuller-Turner-Walsh-Slattery, Inc., has set up a far-reaching communications system. A microphone in the field construction office is connected through a telephone exchange with loud speakers located strategically about the site. Supervisors who are paged through this hook-up go to the nearest telephone to talk with the field office. It is planned to extend the system as the structure rises by placing a loud speaker and telephone on every fourth floor. Then keymen will never be more than two floors removed from contact with headquarters. The 50-watt amplifier used permits the paging system to be heard above the din of riveting hammers and other construction noises.

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Smithy Is Now a Traveler

In this modern automotive age, horseshoeing or farriery is a declining but a far from disappearing art. Strangely enough the motor truck, one of the inventions that have cost today's horseshoers business, has become their ally. Approximately 1000 of the 8000 remaining farriers in the nation have mounted their forges and other equipment on trucks in which they make the rounds of their customers. Thus outfitted, a competent man can and does earn around $8000 a year, according to the Horse and Mule Association of America. Nevertheless, there is a shortage of smiths, and that has prompted the aforementioned association to offer scholarships for courses in farriery at Michigan State College and California Polytechnic Institute. Most of the students are former GI's, and more than 50 have been graduated.

Between 1910 and 1948, the horse-and-mule population of the country slumped from 24 million to less than nine million, while farm tractors rose from virtually none to three million. Of the equine total, only about two million wear shoes, the others do not need them because they work on soft ground. Those that are shod must be refitted every four to six weeks. Each job brings the farrier from $5 to $15, depending upon the type of shoes and whether they are put on a race, show, riding, or work animal. The new-style artisan, with his forge on wheels, can shoe from six to eight animals a day. *Automobile Facts*, from which we culled the foregoing information, sums up the trend with this bit of verse:

Under the spreading Chestnut tree
The village smithy's not.
He found there's no percentage in
Just standing in one spot.

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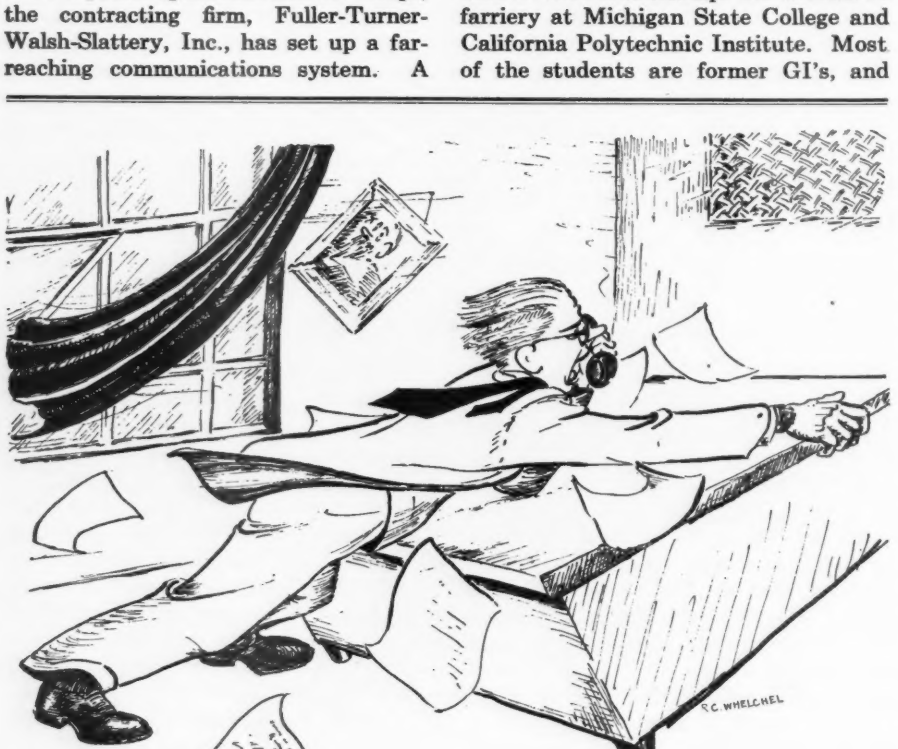
Janitor Cited for Service

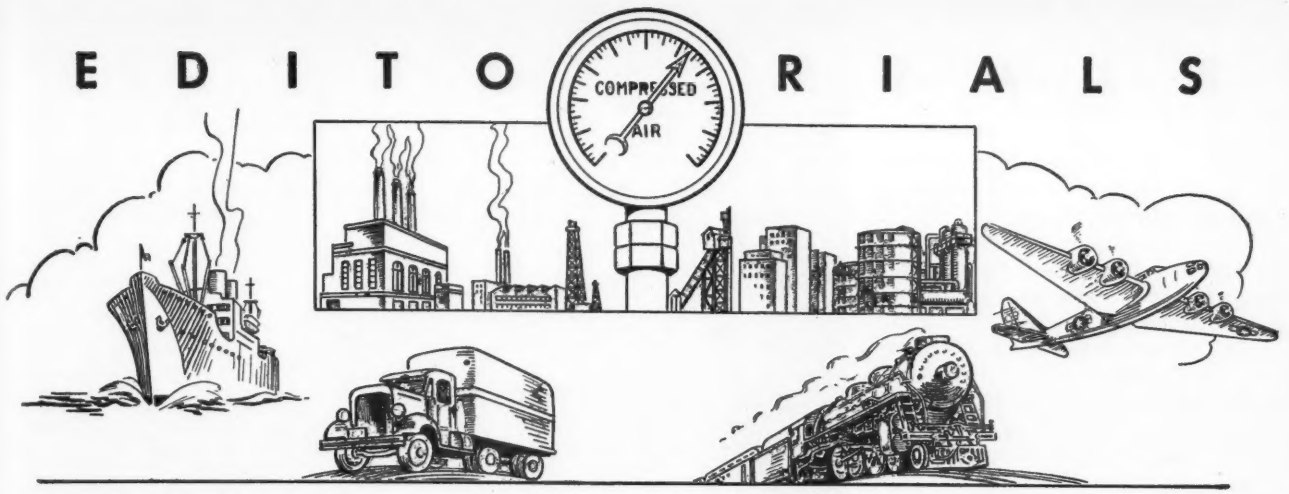
Further proof that this country recognizes merit in all ranks is found in the announcement that Thomas P. O'Neill, 68-year-old janitor in the Boulder City, Nev., offices of the U. S. Bureau of Reclamation, has been cited to receive an honor award. His service as camp cook when field parties were surveying for Hoover Dam is especially remembered. Handicapped by the desert heat, sandstorms, lack of refrigeration, and scarcity of fresh food, he still managed to keep the engineers healthy and fairly contented. Butter and fresh meat, when they were to be had, were kept at the bottom of a moistened hole. At night, to thwart coyotes and other prowlers, meat was wrapped in oiled paper and suspended from trees. O'Neill ranged the prairie with his gun to add game and wild fowl to the larder, and when camp was pitched near the Colorado River he saw to it that there was fish on the table.

There being no doctor around, O'Neill ministered to the party's ailments from sunburn to snake bite. He also patched clothes and repaired shoes. His tenor voice, trained at St. John's Academy, Brooklyn, N. Y., in his boyhood, contributed to the singfests to which the men turned for relaxation. Among O'Neill's table guests were Herbert Hoover, champion pugilist Jim Jeffries, various congressmen and senators, and innumerable prominent engineers and scientists. Although labor turnover in the camp was heavy, O'Neill stuck it out and there was little sickness in the camp. He intends to continue serving the bureau as janitor until he reaches the mandatory retirement age of seventy.



"Hello, Acme Air Conditioning!"

EDITORIALS



DEVELOPMENT OF ALASKA

THE first comprehensive movement toward the colonization and economic development of Alaska since it became an American possession 82 years ago has been launched by the Department of the Interior. Acting under congressional authority, the Department's Bureau of Reclamation has prepared a report recommending utilization of the territory's water resources for generating power, bringing land under cultivation, and providing recreational facilities. After review by various Federal agencies, the report will be submitted to the Congress as a basis for possible legislation.

The potential hydroelectric capacity of Alaska's rivers is eight million kilowatts, the report states. That is more than half the waterpower output of the United States and three times the installed capacity of the Tennessee Valley Authority. More than a dozen areas have been designated as containing possible power-plant sites.

It is the belief that the settlement and the industrial upbuilding of Alaska would be accelerated by making electricity available. Only 100,000 persons reside there now, whereas Secretary J. A. Krug of the Interior Department estimates that its natural resources could support five million on a high standard of living.

Alaska has an area of 586,000 square miles, or about one-fifth that of the United States. Leaving out the treeless northern section, 386,000 square miles are considered habitable. It is advocated that steps be taken to bring 135,000 acres of new land into agricultural production as soon as possible and to develop water supplies for municipal and industrial use.

Military authorities are in accord with the recommendations, because strengthening of the internal economy of Alaska would reduce the expenditures necessary for adequate defense. Thus far, the construction of only one project has been proposed—the Eklutna on which a report was sent to Congress last February. It calls for the building of a low dam to raise the level of Eklutna Lake, near Anchorage, 2 feet and for the driving of a 4½-mile tunnel to carry water to a generating station. The latter would have a capacity of 30,000 kw. and would supplement a 2,000-kw. plant now operated by the City of Anchorage.

The estimated cost of the development is $21,500,000, of which more than $20,000,000 it is believed would be returnable to the Government with 3 percent interest through sales of power over a 52-year period. Anchorage has a population of 19,000. Nearby are a military airfield and an army base, both of which would use some of the power. Also in the area is the Government-sponsored Matanuska Valley farming area.

BRITISH MINING CONCLAVE

REPRESENTATIVES of sixteen countries of the British Commonwealth and of eleven other nations, including the United States, are participating this month in the Fourth Empire and Metallurgical Congress. Following opening formalities and visits to laboratories and engineering works in London from July 9 to 12, five days will be devoted to technical sessions at Oxford. Upon their conclusion, two weeks will be spent in tours of mines and industrial plants in England, Scotland, and Wales. Among other localities to be visited is Cornwall, birthplace of British mining and still a tin-producing center.

The first congress, sponsored by technical institutions identified with the mineral and metal industries, was held at Wembley in 1924 and was so successful that it was planned to conduct one triennially thereafter. This schedule was maintained for a time by convening in Canada in 1927 and in South Africa in 1930. The fourth congress was to have been held in Australia in 1933, but economic conditions forced its cancellation. Prolongation of the depression and World War II combined to postpone the meeting until this year.

As is true of such gatherings in this country, the principal purpose of the Congress is to permit scientists, engineers, and others connected with mining and metallurgy to exchange ideas and bring themselves up to date on technological developments in their field. It can be appreciated what this will mean to the 600 delegates and members who have been deprived of this opportunity for nineteen years.

BOOKS FOR EUROPE

FOR the past several years CARE, a nonprofit agency approved by the Government, has done an effective job assisting Americans in sending food packages to hungry Europeans. Now it is to extend that service by furnishing "food for the mind." This plan is aimed at replenishing technical schools and libraries that were victims of Hitler's book-burning campaign and of bombings.

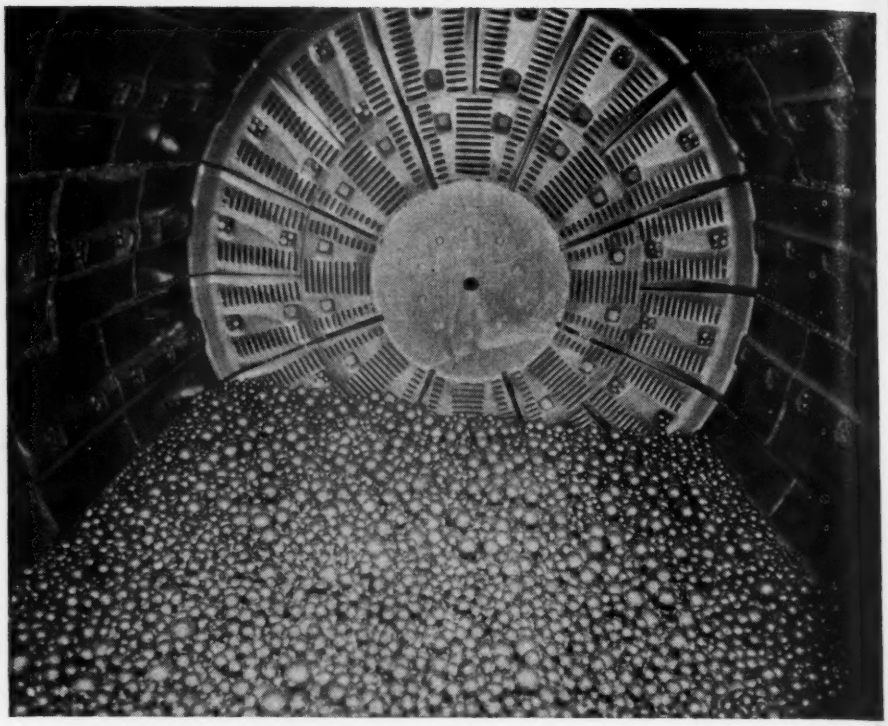
Libraries and educational institutions in fourteen war-torn nations are furnishing CARE with a list of their most urgent book needs. Through contributions from American people, CARE will fill the requirements as closely as possible by purchasing the best books in those fields published in the United States. Selection of titles will be based upon lists compiled by a committee headed by Dr. Luther Evans, Librarian of Congress. All books will be in English and purchased at publishers' list prices. No used ones will be sent.

For the present, the books will fall in these categories: health and welfare, medicine, dentistry, veterinary science, nursing, agriculture, English language instruction, biology, chemistry, engineering, geology library administration, mathematics, physics, physiology, psychology, sociology, and statistics. Donors of $10 or more may designate the country, the institution, and the category (but not the title) of the books to be provided, and will receive a receipt. Gifts of less than that will be pooled with others in a general fund. Contributions may be sent to CARE headquarters at 20 Broad Street, New York 5, N. Y., or to any CARE outlet in the country.

Mucking by Air Lift

EXCAVATING by water jet and mucking by air lift were used to good effect in sinking foundation caissons for a 25-ton crane in Sydney Harbor, New South Wales. The caissons have a diameter of 20 feet and were carried to bedrock through 50 feet of tough clay by means of a specially designed hydraulic auger provided with seven jets each delivering a stream at 150 psi. pressure. Three jets with 1-inch orifices projected from a central shaft surrounded by four extensible winglike pipe sections each of which terminated in a ⅝-inch nozzle. The assembly was operated from a surface platform and rotated in a horizontal plane by a turntable and hand winch.

Under the powerful force of the jets the hard clay was broken up, permitting the cutting edges of the caisson to penetrate progressively deeper under the weight of the structure. The loosened material, some of which was in sizable chunks, was handled by air lift and discharged at the surface into a flume for disposal. Upon reaching bedrock, a pneumatic sump pump was used to remove seepage. More than 15,000 cubic feet of clay had to be excavated in sinking each caisson.

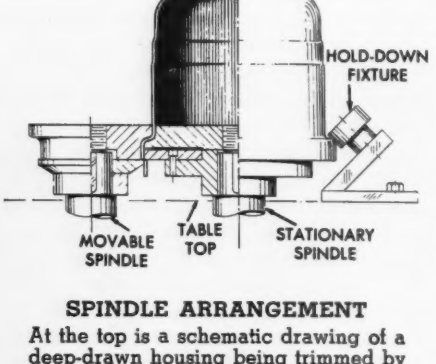


INTERIOR OF A BALL MILL

Ball mills are used for the fine grinding of many ores, but pictures of their insides are comparatively rare. This one shows the interior of a Hardinge mill, 10 feet in diameter and 12 feet long, that is used in the Patrick wash plant of Butler Brothers, producers of iron ore at Cooley, Minn. When the cylindrical vessel is revolved by a 750-hp. motor, the ore is crushed by myriads of tumbling steel balls. The latter are originally 2 inches and 1½ inches in diameter, but are reduced by attrition to the various sizes shown. New ones are added from time to time to keep the supply at around 30 tons. The mill treats about 150 tons of ore an hour, crushing it fine enough to release the silica that coats some of the iron particles. The two minerals are then separated in a classifier. The picture was obtained from "The Butler Miner" and taken by R. C. Ferguson, Hardinge Company representative.

Light-Duty Trimmer

A LIGHT-DUTY model has been added by Whiting Corporation to its line of Quickwork stamping trimmers. It is designed for job or production-line work and is said to be suitable for trimming or forming and beading, in a single pass and plane, large and relatively small steel and aluminum-alloy stampings. No dies are required. Special rolls, cutters, and hold-down fixtures are provided, depending upon the work. The machine is equipped with a stationary spindle that is adjusted by hand to take stampings of different sizes, and with a spindle that is moved by an air cylinder cushioned at both ends. The latter has a 6-inch bore and a 6½-inch stroke, uses air at a pressure ranging from 20 to 80 psi., and is controlled by a solenoid-operated foot valve. The trimmer is built for either constant- or variable-speed drive through differential-type transmission which permits the use of rolls or cutters of different diameters without change in peripheral speed. Finished work is said to be smooth because of the shearing action of the cutters.



SPINDLE ARRANGEMENT

At the top is a schematic drawing of a deep-drawn housing being trimmed by the aid of a hold-down fixture at the rate of 125 pieces an hour. Many stampings do not require special jigs and are trimmed on the flat table top by sets of rolls. A foot-controlled air valve leaves the operator's hands free for loading and unloading. The machine, left, is pictured with a representative tooling set-up.

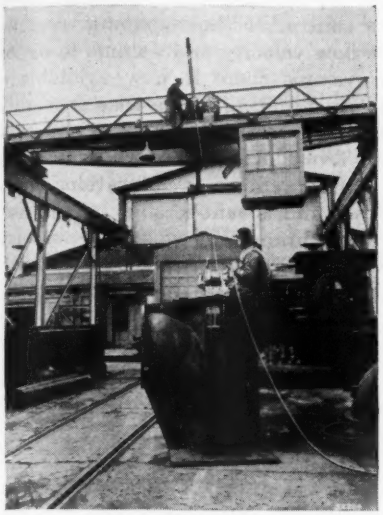
Torch-Tailoring a Ship

BACK in 1942 the U.S. Navy Department converted the side-wheel passenger vessel *Greater Buffalo* into an aviation training ship by replacing her superstructure with a 600x102-foot flight deck. Renamed the *Sable*, she was used on Lake Michigan. With the war over, the Government sought to sell her, but she seemed destined to remain on the inland lake because she was too large to pass through the 100-foot-wide Welland Canal. However, a scrap dealer bought her and figured out a way of moving her to The Steel Company of Canada's works at Hamilton, Ont.

Using oxyacetylene torches, successive lengthwise cuts were made near the outer edges of the deck and the severed strips were pulled back to the vessel's center line with hoists. All told, 16 feet was sheared from each side, and the paddle wheels amidships were removed and lifted aboard. Finally, 40 feet of the stern was cut away to enable tugs to accompany the ship in the locks. This reduced her beam to 70 feet, and with all the shorn metal on deck she was towed to the breaking-up yard at Hamilton. The "Operation Oxygen" required 137,000 cubic feet of oxygen and 21,000 cubic feet of acetylene.

Industrial Notes

A midget single-drum air host that can be carried, installed, and used by one man has been announced by Ingersoll-Rand Company. Designated as the Size BU, it is 18½ inches long, 10¾ inches wide, and 11¾ inches high and has a lifting capacity of 600 pounds at a rope speed of 50 feet per minute. Heavier loads can be handled with the aid of sheave blocks. The new Utility hoist has



a reversible, 4-cylinder air motor that permits lowering loads under power and is provided with a wide band-type brake that insures positive hold. Compact and lightweight, the unit is suitable for a variety of skidding, hauling, and hoisting jobs in mines, on construction projects, and in industrial plants. The one shown is helping to expedite repair work on an overhead crane.

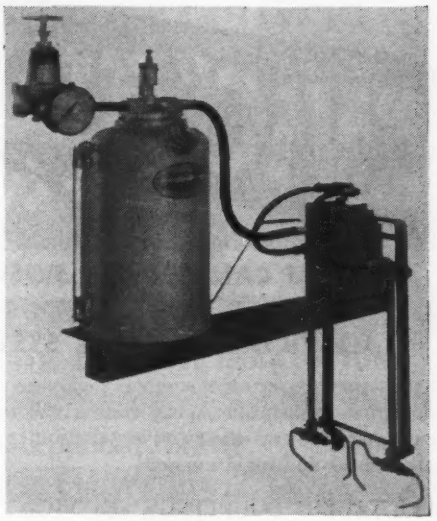
Nylatron G is a new dry bearing material offered by Polymer Corporation especially for use where both rubbing and impact are involved or where lubrication by ordinary means is not possible. It is a graphite-filled nylon supplied in rods from 0.1 to 2¾ inches in diameter, in cylinders of varying wall thicknesses and from 2 to 7 inches in outside diameter, and in strips up to 2 inches wide and from 0.01 to 0.09 inch thick.

Hewitt-Robins, Inc., has announced that its Rubber Division has started a new line of business with the manufacture of an improved rotary wire brush invented by Alfred Flohr and Charles Lavin. The product has been named Rubberlokt by reason of the fact that the bristles are embedded in rubber, a construction that has several advantages over the rigid metal or wood mounting of the customary wire-wheel brush. According to the company, the rubber core permits the bristles to flex throughout their entire length and to return to their upright position. As a result, premature wire breakage is reduced to a minimum, a maximum number of cutting points is kept in contact with the work, the bristles may be worn down to the rubber flange, and the brush conforms well to uneven surfaces. It can be used on either bench or portable tools. Six-, 8-, and 10-inch industrial sizes are available; others are to be put in production.

Curve plotting, tedious drawing, and template making usually take lots of time that can be reduced to seconds, we are informed, by a new layout tool—the Flexible Template. The latter can be laid on a blueprint, for example, to duplicate any desired contour, curve, or radius, and then locked for transfer anywhere for construction or checking purposes. When unlocked it springs back to its normal position ready for reuse. It is made of rugged spring steel and aluminum and available in lengths of 1-foot intervals.

Rubber tubing is being used for molding smooth-bore ducts of uniform diameter, straight or curved, in concrete floors, walls, columns, beams, etc., for power, light, and telephone lines, heating and ventilating systems, drain and grout holes, and for other purposes. It is inflated with compressed air, and when the concrete poured around it has set, the air is exhausted and the hose is withdrawn. It is called Ductube and can be utilized repeatedly.

Trolley-wheel bearings and pins on a twin T-rail Link belt conveyor moving through a core oven are automatically lubricated by a new type oiler designed for the purpose by J. N. Fauver Company. Including a 2-gallon reservoir, the unit is mounted 8 inches above the bearings. As each pair of wheels passes the lubricator it trips a trigger that actuates a Norgren blow valve which releases jets of oil-fogged air so directed as to completely cover the bearings and pins with a thin nondrip film. Air pressure, volume of atomized lubricant, direction and timing of "shots" are adjustable, and a Norgren regulator serves to reduce the pressure of the shop air line to approximately 40 psi.



If you are one of those persons who do occasional painting around the premises, you'll welcome an announcement made recently by the Dewey & Almy Chemical Company because you'll have brushes fit for service whenever you need them. That company says it has produced a plastic bag that is impervious to

GLARE REDUCER SPRAYS ON, PEELS OFF

A green, transluscent resinous liquid that can be sprayed or brushed on factory windows and skylights to reduce summertime heat and glare is made by the Minnesota Mining & Manufacturing Company and marketed under the name of Sun-Stop Strip Coating. A gallon will cover 250 square feet to the recommended thickness of one one-thousandth inch. The liquid dries tack-free in five minutes, and in 24 hours becomes a tough film that withstands water, soap, and most window-cleaning preparations. At the end of the summer it can be stripped off or removed by air blast.

"VIC" TELLS HOW

YOU CAN GET THE MOST *FOR YOUR MONEY* WITH AN *ALL-VICTAULIC* PIPING SYSTEM

A *complete* Victaulic piping system will save you time and money on installation, alterations and maintenance!

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*EASY INSTALLATION of Victaulic Couplings and Fittings is assured . . . simple, quick, and dependable two-bolt design permits pipe lines to be assembled without special skill or training . . . a standard T-wrench is the only tool required to make connections. You can make repairs or changes in your piping system easily, quickly . . . no backing off of adjoining sections is necessary.

*EASY-TO-USE "VIC-GROOVER"... grooves pipe ends automatically . . . *twice as fast* . . . with half the effort of conventional pipe threader!

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YOUR PIPING COSTS can be kept at a *minimum* with a *VICTAULIC SYSTEM.*

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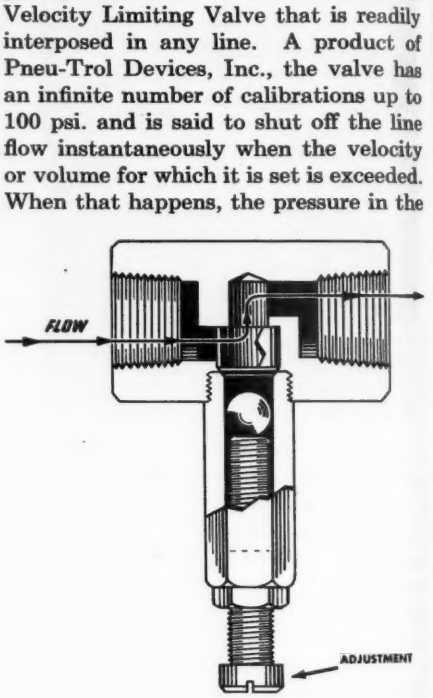
the solvents and oils in standard paints and that will keep bristles soft and pliable for long periods. The bag is being offered to paint manufacturers for use as a premium.

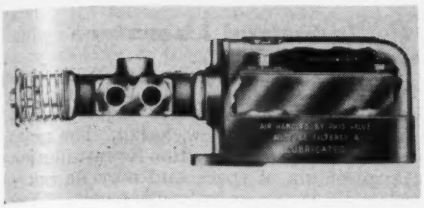
To prevent rusty gas tanks that have been known to result in clogged fuel lines, strainers, and carburetor jets, the Sinclair Refining Company is offering the motoring public gasoline to which R-119, a rust inhibitor, is added.

For operations that necessitate definite control of the maximum permissible flow velocity and volume in air or gas systems there is now available a Velocity Limiting Valve that is readily interposed in any line. A product of Pneu-Trol Devices, Inc., the valve has an infinite number of calibrations up to 100 psi. and is said to shut off the line flow instantaneously when the velocity or volume for which it is set is exceeded. When that happens, the pressure in the



line pulls a stainless-steel ball against its seat and holds it in closed position until the pressure is exhausted, allowing it to drop back to its predetermined place. The valve is set by an adjusting screw. The device has varied uses such as shutting off the air or gas supply in case of line breakage or system failure. It is also recommended for multiple cavity moding where pieces are ejected by compressed air. In operations of this kind it is necessary to stop the flow of air to each open cavity, in turn, as soon as the piece has been blown out, and this can be done automatically by incorporating a Velocity Limiting Valve in the air hose leading to each cavity. The device is available in ¼- and ⅜-inch pipe sizes.

Valvair Corporation has announced a new line of spring-return single-solenoid valves for air pressures from 0 to 125 psi. The model has a powerful solenoid for positive seating and cool operation, "OU" type packer, shock-resisting clevis and pin, a one-piece bronze base, and is protected by a heavy sheet-metal



cover. Sizes offered are ¼, ⅜, and ½ inch, and each is available for 110-, 220-, and 440-volt 50-60 and 25-cycle current and in the following types: 2-way, 3-way open end exhaust (normally closed only), 3-way piped exhaust, and 4-way piped exhaust.

Firmly secured lengthwise between the halves of a new concrete block—called Insol—is an asphalt-treated board, ½ inch thick, that doubles the number of air spaces and gives it considerable insulating properties. Licenses to make the block can be obtained by local plants from the Insol Company of St. Paul, Minn.

A building that will follow Chinese architectural lines is being erected in New York's Chinatown as headquarters for the Chinese Merchants Association. Surmounting the red-and-yellow structure will be three floors with verandah-like extensions on all sides. The Caye Construction Company, Inc., has the contract for the building and has modeled it after pagodas that rise over the entrance gates of Chinese walled cities.

If you are planning to build a house without a basement, you might do well to follow the advise given by the U. S. Department of Agriculture. It recommends covering the site with heavy roll roofing material—55 pounds per 100 square feet—as a protection against the deteriorating effects of ground moisture. Tests have proved that a layer of this kind keeps the crawl space beneath the structure much drier than it would be with the soil exposed and under normal conditions of subfloor ventilation, thus greatly offsetting destruction through rot and rust.

It is reported from Cleveland that straw—virtually any kind—can be used to manufacture not only paperboard and the like but any kind of paper. This broad claim is made by the Kinsley Chemical Company, which has developed a process that is based on a secret chemical produced by Edward R. Timlowski, the company's technical director. The substance makes it possible to separate the straw into its individual fibers without reducing their length, thus making it a suitable raw material for high-grade paper. Twelve plants designed in accordance with the new process are planned for widely scattered parts of the globe, including the United States.

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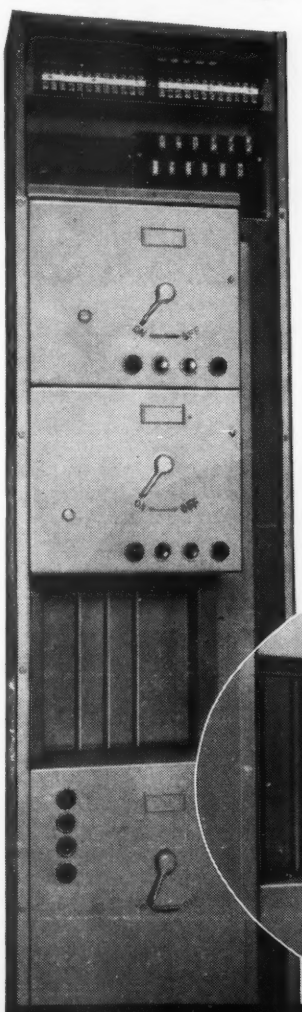
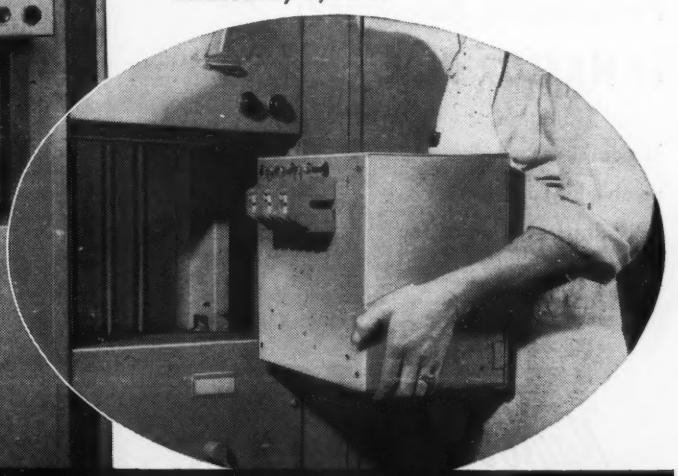
SIMPLIFIED SERVICING



These advantages, plus many more, are yours when you buy economical, G-E motor control centers. Only 12 inches deep, front connected, pre-engineered, can be factory assembled, wired, and tested. Individual sections can hold combinations of two or more sizes of starter units. (NEMA Size 1, 2, 3, and 4 for 1 to 100-hp a-c motors, 440 volts or below). Standard starters in standard vertical sections simplify installation, servicing, and stocking spare parts, yet permit flexible arrangements.
In addition, each unit is "wrapped in steel," has built-in short-circuit and overload protection. Wiring troughs are five inches wide, terminal and incoming bus may be at top or bottom as you prefer—all easily accessible. Wiring time is cut because "clothespin contacts" (below) connect to incoming power in one quick shove. Write now for more details in Bulletin GEA-4979. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



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ADV. 17 (188)

Industrial Literature

Ortman-Miller Machine Company, Inc., Hammond, Ind., will send upon request descriptive literature concerning industrial power cylinders of a new design. The units are of tie-rodless construction for installation in a minimum of space and may be operated by air, water, or hydraulic power. They are available in bore sizes ranging from 1½ to 8 inches and are said to give continuous service at speeds up to 1500 cycles a minute.

Corrosion-resistant piping materials are the subject of a 32-page circular obtainable from Crane Company, 836 South Michigan Avenue, Chicago, Ill. The publication contains descriptions, illustrations, and technical data on noncorrosive valves, fittings, fabricated piping, and pipe coils designed to operate under a wide range of conditions. Included are eight pages of recommendations of types of piping and fittings best suited for each corrosive liquid handled.

Bulletin 125 of Hose Accessories Company describes its complete line of hose clamps for industrial and construction use. More than 160 different sizes and kinds are covered. It also contains information on a group of undersized hose clamps designed to fit the newer types of hose having small outside diameters. Copies of the bulletin may be obtained by writing to the company at Seventeenth & Lehigh Avenues, Philadelphia 32, Pa.

What is believed to be the most extensive bibliography available on the subject of industrial uses of radioactive tracers has been compiled and published by Arthur D. Little, Inc., the well-known firm of research engineers. In addition to sources of general background and survey articles there are references to articles covering specific fields such as petroleum, mining, metallurgy, textiles, pharmaceutical, etc. Copies of the bibliography can be obtained free of charge from the company at Cambridge 42, Mass.

Air-Powered Equipment for Oil-Well Drilling is the title of Form 157 obtainable from Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y. Compressors, pumps, cranking motors, hoists, and air tools designed or suitable for oil-field work are described and their uses cited. The bulletin explains how pneumatic equipment, if properly applied, can lighten labor considerably, prevent many of the dangers involved, and reduce operating and maintenance costs.

W. C. Dillon & Co., Inc., 5410 West Harrison Street, Chicago 44, Ill., will send to interested parties a folder describing its low-range, universal-type testing machine. It is intended for use in laboratories where raw materials or finished parts are subjected to tension, compression, or elongation tests. The equipment is fitted with an 8-inch dial having four concentric scales which may be calibrated in tenths, ounces, pounds, or kilograms. It is designed to test paper, thread, fabrics, plastics, film, cord, leather, wire, glass, wood, ceramics, insulating material, adhesives, or virtually any material light enough to fall within the range of the scales.

Flexible shafting for power drives and remote controls is the subject of a manual recently published by Elliott Manufacturing Company, 350 State Street, Binghamton, N. Y. Designed for the easy transmission of power to out-of-the-way places, the shafting may be used with drilling, reaming, grinding, sanding, polishing, or wire-brushing machines; as a flexible coupling between machines; for power take-off; for the remote

control of valves, dampers, etc.; and for numerous other purposes. It is made in a range of sizes to meet these varied requirements. In addition, the company manufactures a line of light- and heavy-duty machines to power the shafting. These may be fitted for floor, bench, or overhead mounting.

New York Belting & Packing Company will send upon request a booklet discussing its varied line of air hoses for welding, service station use, mining, pneumatic tools, and other services. The publication gives complete specifications and data on hose construction and application, as well as instructions in good air-hose engineering practice. Also available is a 24-page manual dealing with conveyor and elevator belting for operations such as coal and iron mining, food processing, packaging, etc. Methods of handling grain, stone, sand, gravel, soda ash, cement, foundry sand, and hot materials are included, as well as information on the selection, application, carrying capacities, and approximate belt weights.

Air valves suitable for use with pressures up to 150 psi. are described in Catalog 301 of Gerotor May Corporation. Made in five sizes from ¼ to 1 inch, they are available with hand, foot, solenoid, cam, or pilot control. Working drawings and cutaway views of each of the 21 different models are included, as well as circuit layouts showing the important types of control, the arrangement of the air equipment, and the operating sequence. A second publication, Catalogue 201, describes the 90-odd Gerotor 4-way hydraulic valves and gives details about their installation, functioning, and control. Copies of both catalogues may be secured from the company at Baltimore 3, Md.

Three bulletins have been made available for free distribution by The Bellows Company, 222 West Market Street, Akron, O. Bulletin P-400 describes air-powered impact and arbor presses for riveting, staking, forming, pressing, stamping, and other work with a reduction in production costs and with greater safety and less human effort, it is claimed. Bulletin BM20-R deals with the construction and application of Bellows nonrotating air motors—double-acting, reciprocating cylinders with built-in valves and controls. They have numerous industrial applications where pushing, pulling, or lifting are involved. Bulletin HC-600 covers the Bellows Hydro-Check, a device designed for use with sensitive tools or delicate work-feeding jobs where a high degree of control must be exercised. It consists of a hydraulic cylinder and an air cylinder, the former acting as a check on the latter to assure smoothness of operation.

Instruments for process measurement and control are described and their installation and operation discussed in a 32-page bulletin recently issued by The Foxboro Company. They may be pneumatically or electrically controlled and are used for regulating process variables such as temperature, pressure, conductivity, pH, flow or liquid level, humidity, force, position, speed, etc. Types shown include a device that continuously makes as many as six different-colored temperature recordings on one circular chart; another that makes as many as 24 individual and periodic temperature checks in sequence on one chart; a scanning recorder for successively registering 24 separate but related temperature measurements; and an indicator which, when fitted with a multiple-key selector switch, permits the rapid observation of 48 individual readings of a process variable. Copies of Bulletin No. 427 may be obtained from the company at Foxboro, Mass.

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